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VOLUME LXXXIII

June 1952

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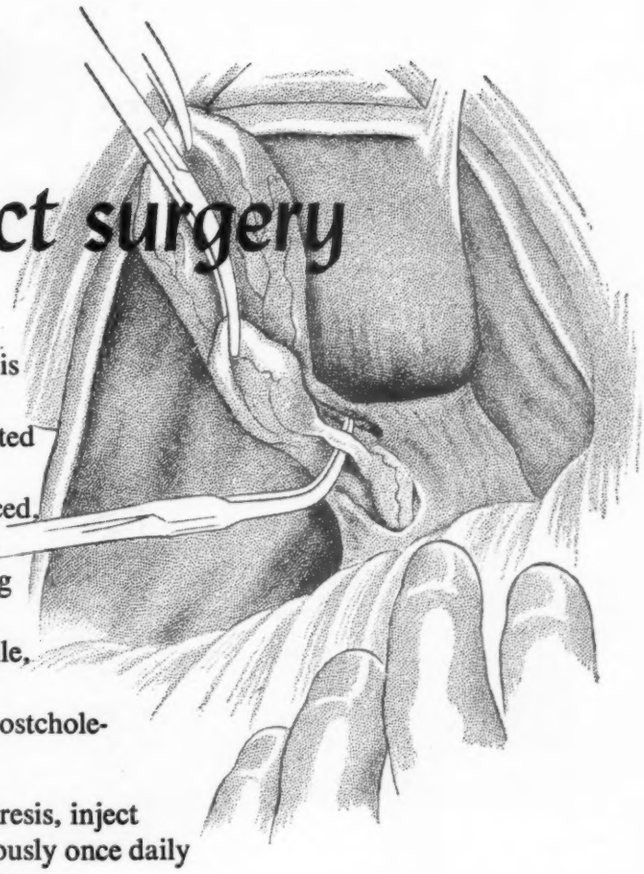

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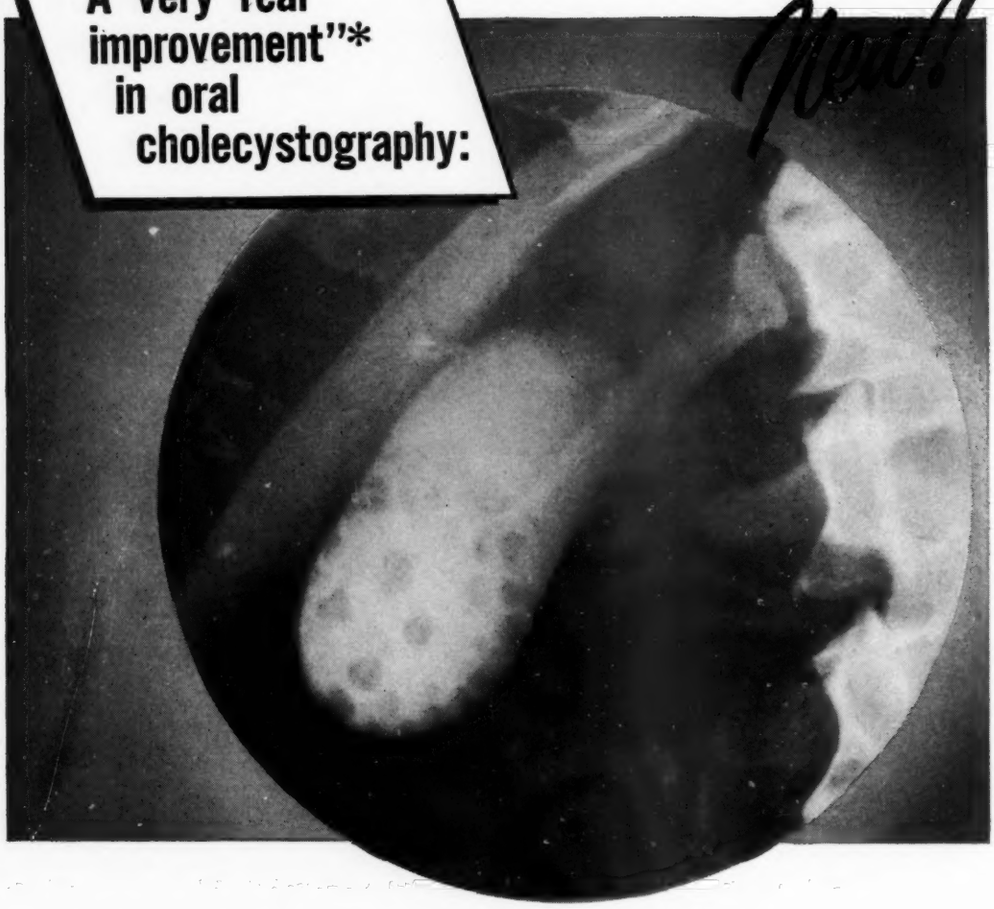

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1. Moore, D. C.: Anderson, L.; Wheeler, G., and Scheidt, J.: The Use of Parenteral Dramamine to Control Postoperative Vomiting: A Report of 1,192 Cases, presented at the American Society of Anesthesiologists, Washington, D. C., Nov. 5-8, 1951.

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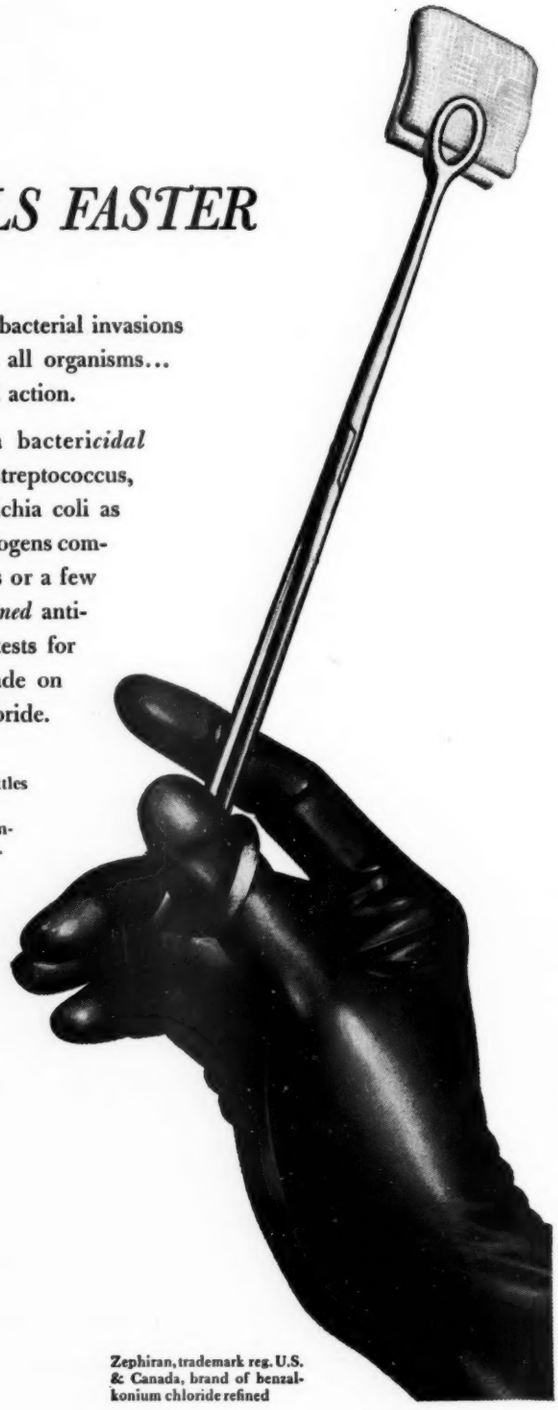

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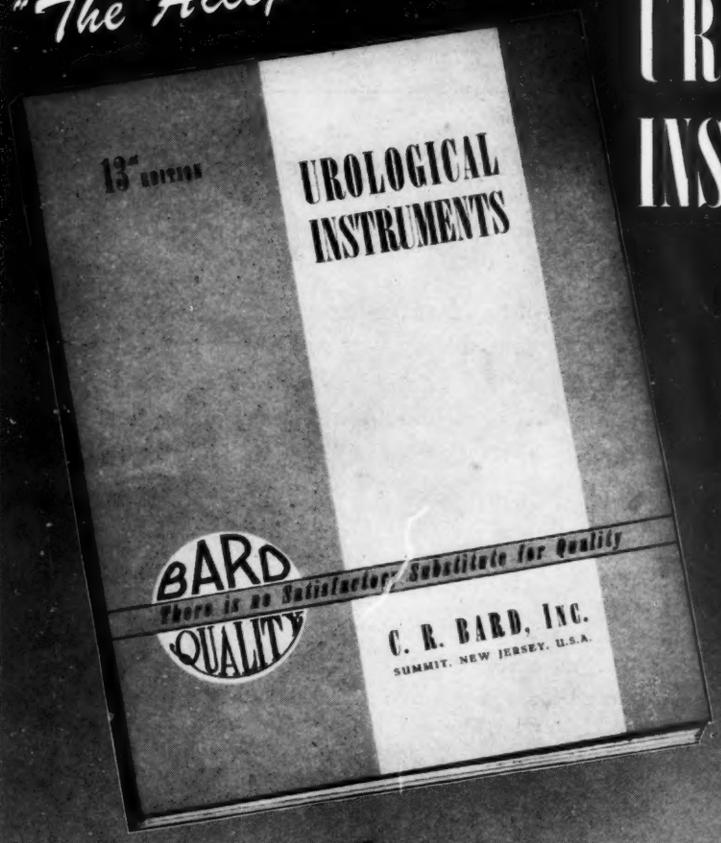

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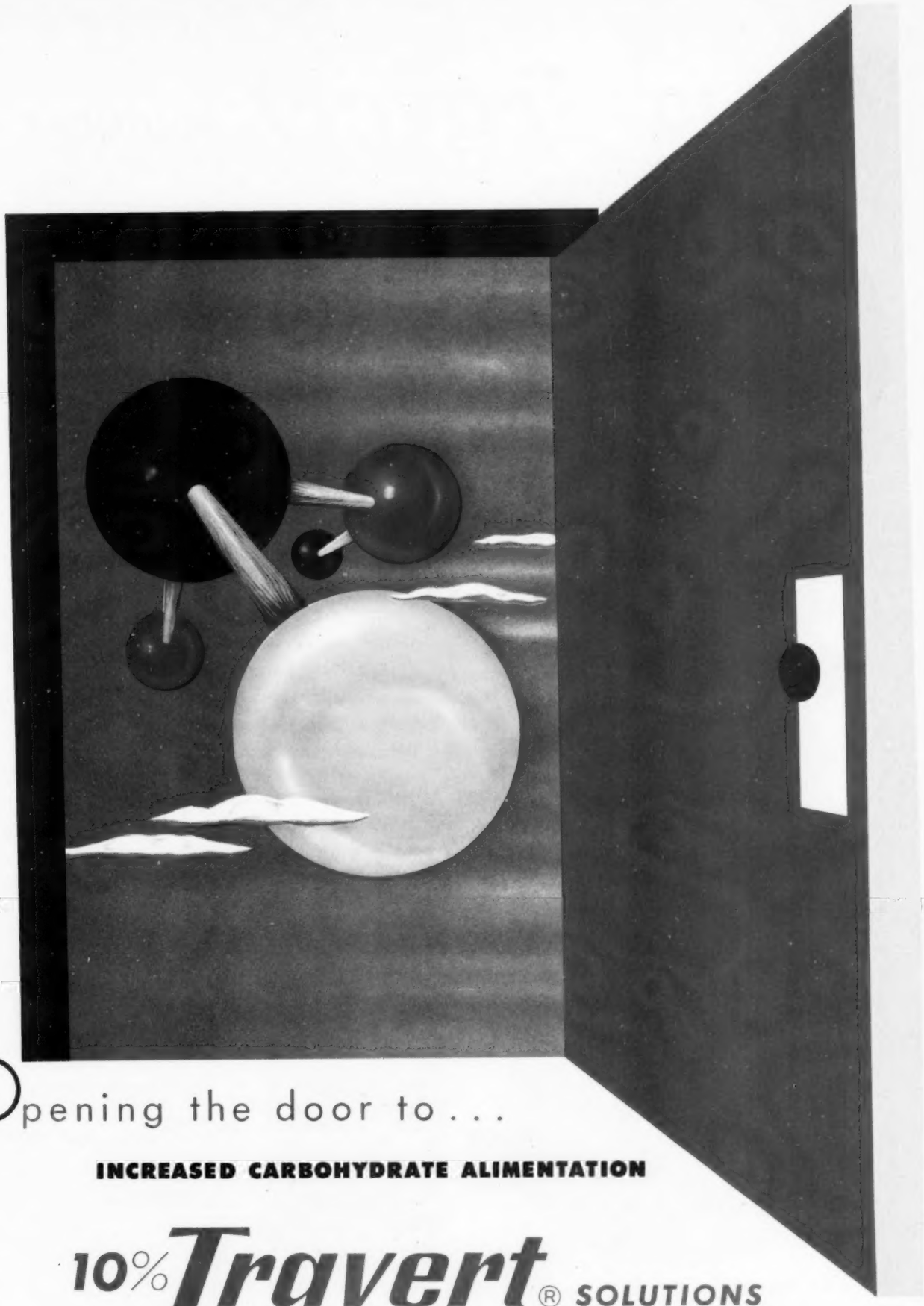

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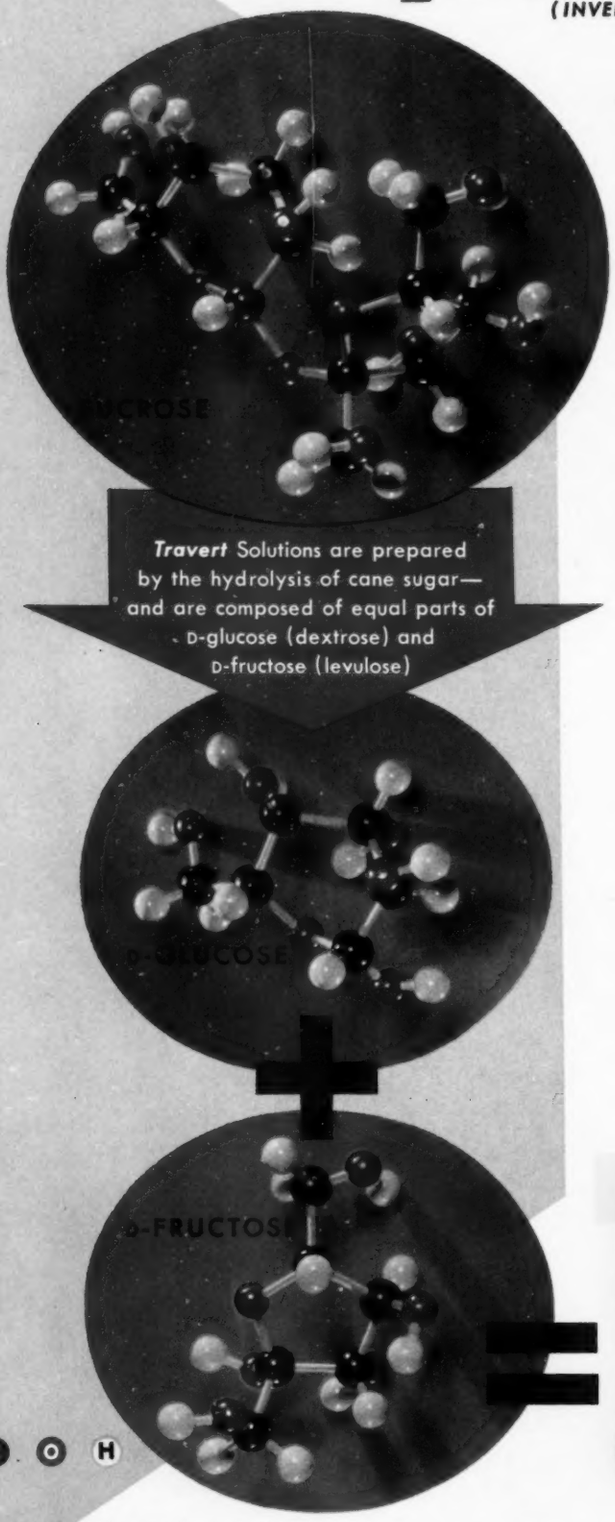

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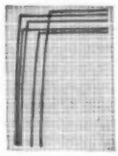

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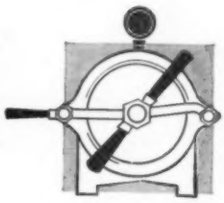

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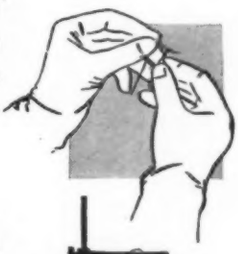

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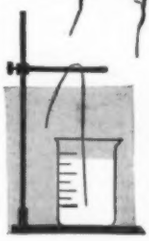

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1. Journal-Lancet 70:298, 1950.
2. Rocky Mountain M. J. 48:99, 1951.
3. Am. J. M. Sc. 218:298, 1949.
4. J. M. Soc. New Jersey 48:12, 1951.
5. Am. J. M. Sc. 219:139, 1950.
6. U. S. Armed Forces M. J. 1:332, 1950.
7. Circulation 1:502, 1950.
8. Cincinnati M. J. 31:137, 1950.
9. Southern M. J. 44:44, 1951.
10. M. Times 79:83, 1951.
11. J. A. M. A. 146:250, 1951.
12. Circulation 1:508, 1950.

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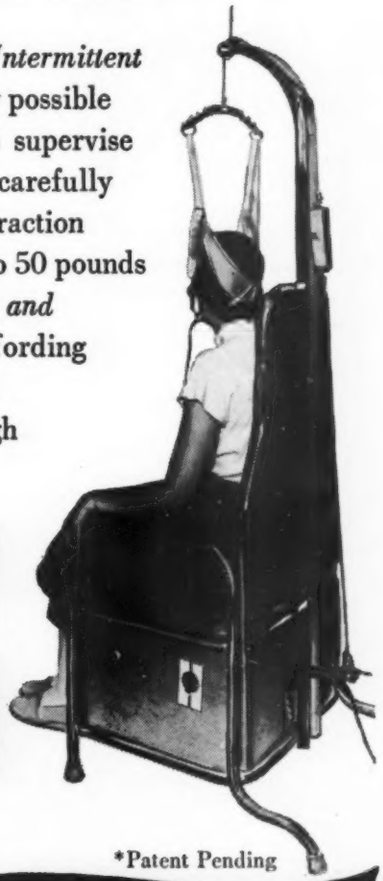

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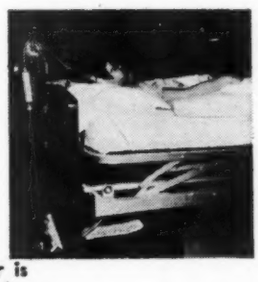

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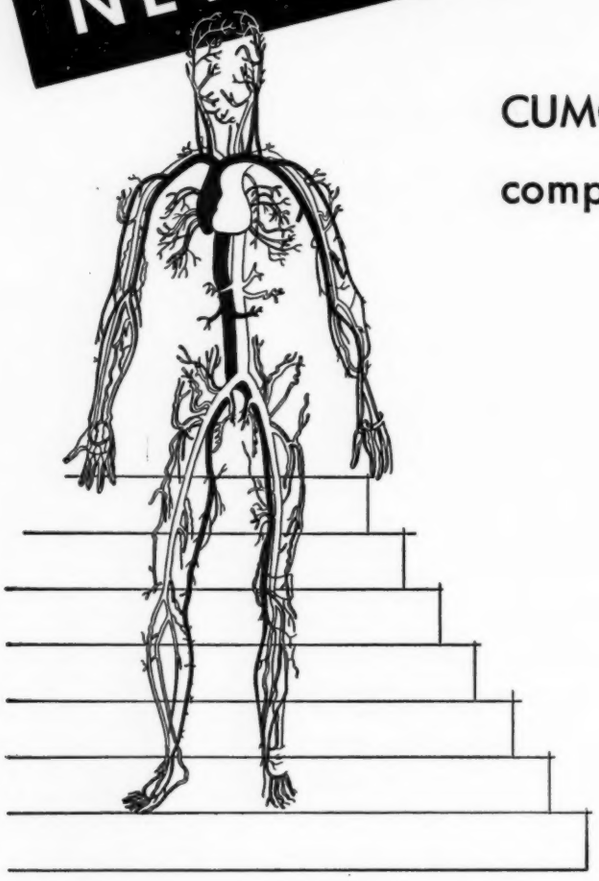

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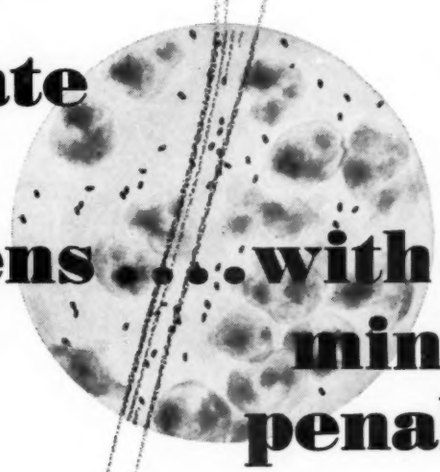

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SULAMYD Tablets: 0.5 Gm.

Schering CORPORATION
BLOOMFIELD, NEW JERSEY

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For *Dynamic* Fracture Fixation Without Impacting Marrow Cavity

The RUSH MEDULLARY PIN

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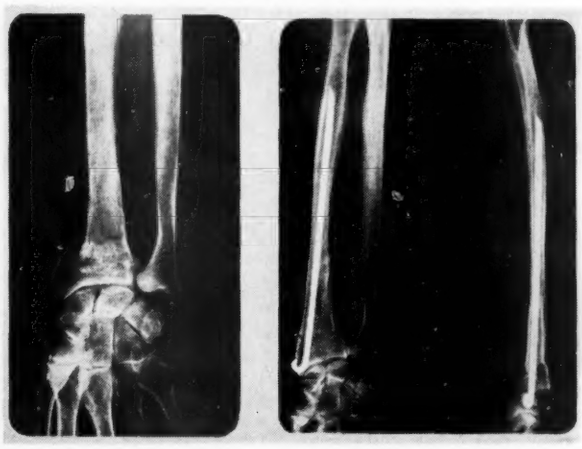
"BERIVON"®

if it isn't Berivon
it isn't a Rush Pin

Optimum temper based on fifteen years research

EVEN FOR COLLES'



For Fractures:

- **of shafts**
- **near joints**

Write for information

FOR IMMEDIATE DELIVERY
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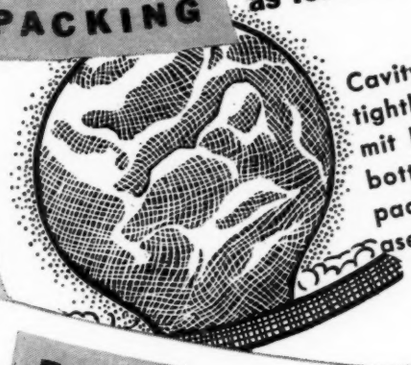
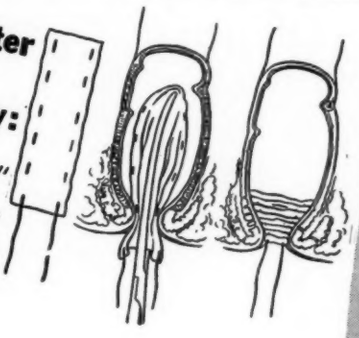
PACKING as for abscess cavity:



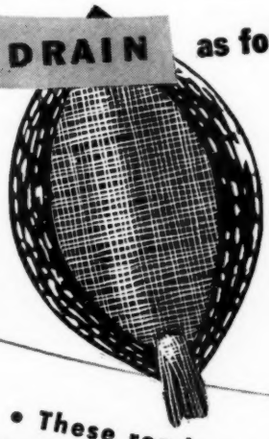
Cavity is fully but not tightly packed to permit healing from the bottom — and is repacked weekly, using aseptic precautions.

PLUG as after **hemorrhoidectomy:**



Petrolatum gauze "sponge" is (a) threaded as shown, (b) inserted beyond sphincter, (c) and then pulled down snugly against bleeding points.

DRAIN as for septic wounds:



Non-toxic, non-adherent, non-macerating—will not cause pressure necrosis or erosion...increasingly used in place of rubber drainage tubes.

- **These ready-made dressings now available in three sizes:**

No. 1: 3" x 36" (6 in carton)
No. 2: 3" x 18" (12 in carton)
No. 3: 6" x 36" (6 in carton)

Obtainable from your regular source of supply

Specified for "1001" SURGICAL USES

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Adopted as standard procedure by surgeons, as preferred matériel by ORS's and CSS's, these superior dressings are used as wound coverings and packings, as plugs and drains—as well as being the most widely-used definitive dressing for burns and abrasions.

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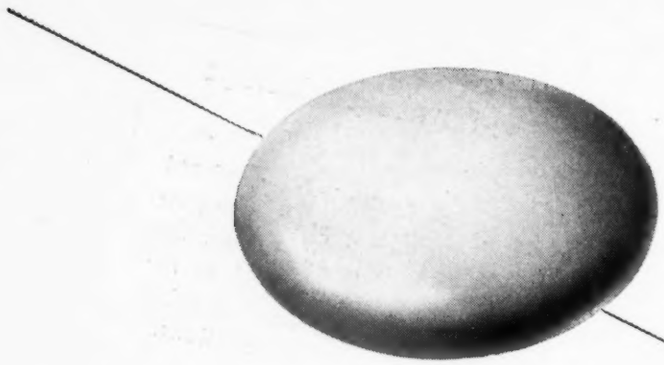
Insist on these superior ready-made, dependably sterile dressings—for your use in indicated surgery, major or minor, emergency or elective.

VASELINE is the registered trade-mark of the Chesebrough Mfg. Co., Cons'd



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in broad-spectrum therapy

Easily swallowed, sugar-coated Terramycin Tablets introduce new flexibility in prolonged courses of administration and are particularly suited to effective, well tolerated therapy among patients preferring tablets to other oral forms.

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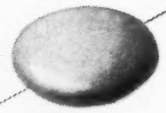

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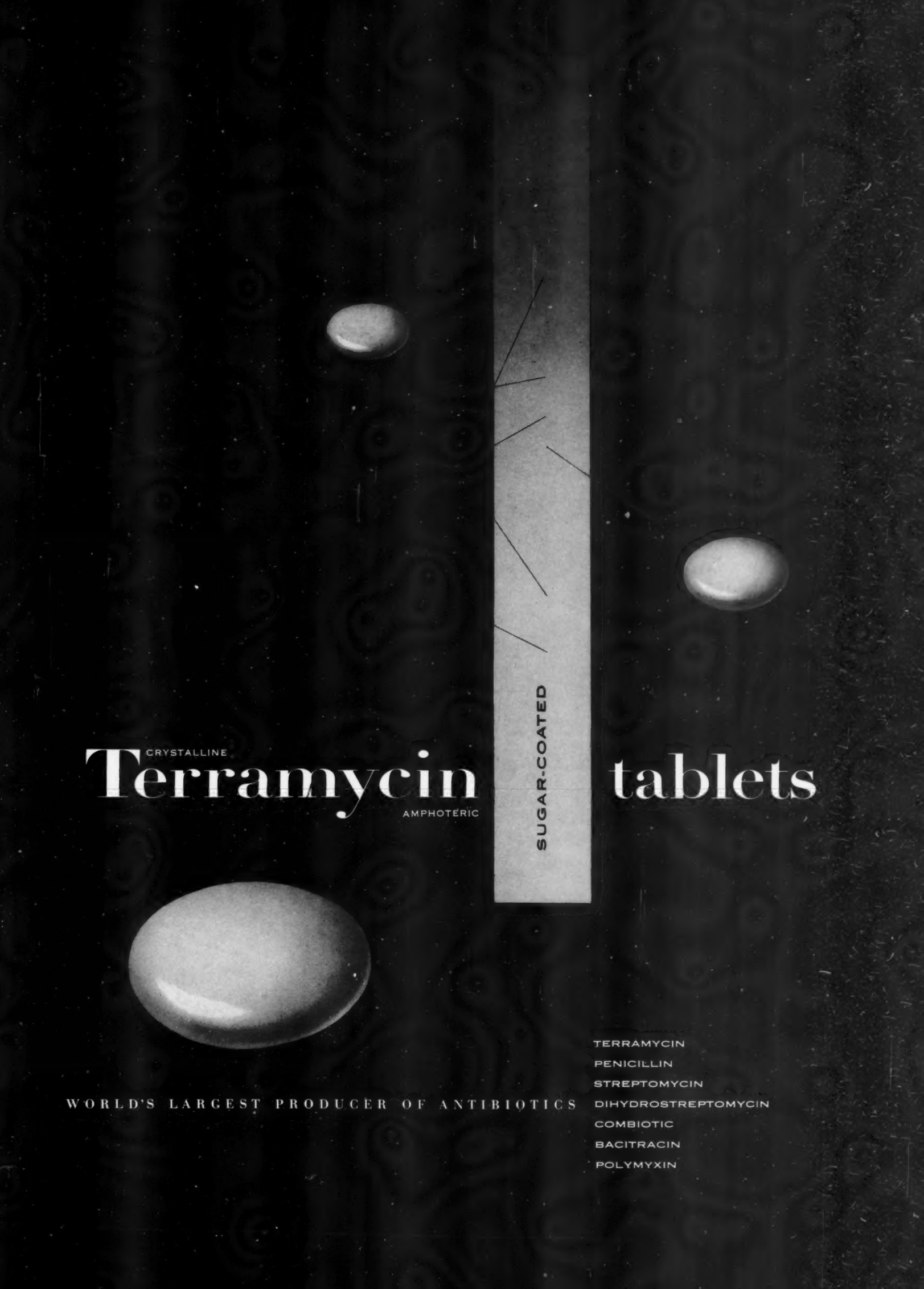
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Protective, soothing, healing, Desitin Ointment is a non-irritating, blend of high grade, crude Norwegian cod liver oil (with its unsaturated fatty acids and high potency vitamins A and D in proper ratio for maximum efficacy), zinc oxide, talcum, petrolatum, and lanolin. Does not liquefy at body temperature and is not decomposed or washed away by secretions, exudate, urine or excrements. Dressings easily applied and painlessly removed. Tubes of 1 oz., 2 oz., 4 oz., and 1 lb. jars.

write for **samples** and literature

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in **wounds**
(especially slow healing)
burns
ulcers
(decubitus, varicose, diabetic)

1. Behrman, H. T., Combes, F. C., Bobroff, A., Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.
2. Turell, R.: New York St. J.M. 50:2282, 1950.
3. Heimer, C. B., Grayzel, H. G., and Kramer B.: Archives Pediat. 68:382, 1951.

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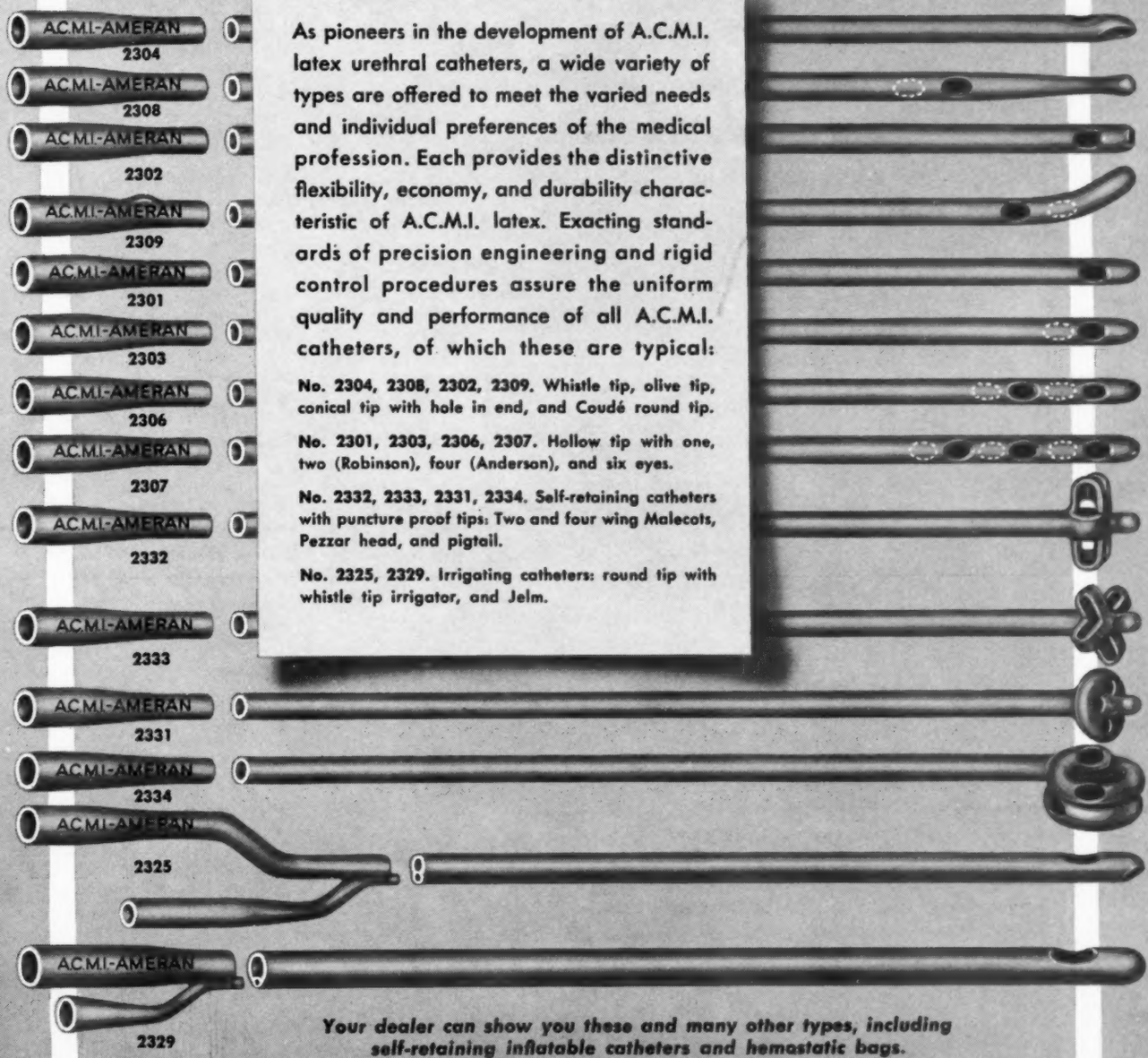
by A.C.M.I.—to meet varied requirements



As pioneers in the development of A.C.M.I. latex urethral catheters, a wide variety of types are offered to meet the varied needs and individual preferences of the medical profession. Each provides the distinctive flexibility, economy, and durability characteristic of A.C.M.I. latex. Exacting standards of precision engineering and rigid control procedures assure the uniform quality and performance of all A.C.M.I. catheters, of which these are typical:

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No. 2301, 2303, 2306, 2307. Hollow tip with one, two (Robinson), four (Anderson), and six eyes.

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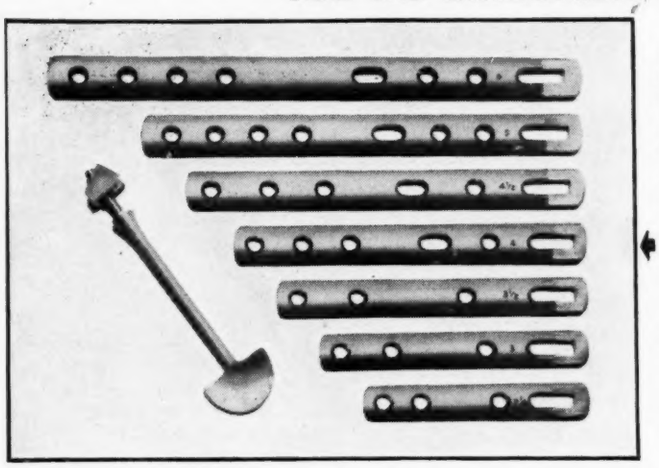
FOR THE ORTHOPEDIC SURGEON



Keeping in step with the requirements and techniques of the nation's foremost surgeons are these three of the newer items in the extensive line of Vitallium Surgical Appliances. Each has been designed by the initiating surgeon to serve a definite need.

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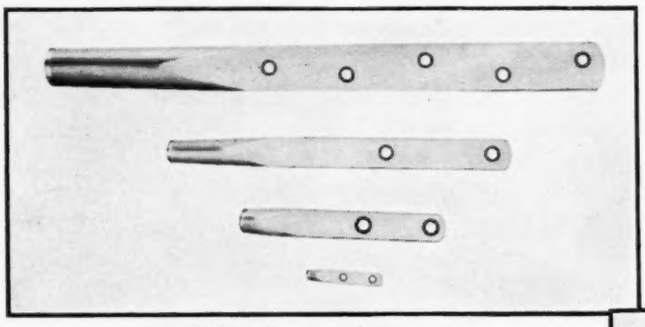
The Coaptation plates are used to impact the fracture ends forcefully and hold them firmly impacted. Such impacted coaptation facilitates uninterrupted blood supply to the traumatized bone cells and promotes early bone healing without excessive callus formation.

The Coaptor is a necessary tool in the application of these plates. Plates are available in seven lengths of 2½ to 6 inches.



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These acute-angled blade-plates are useful for fractures about the knee, especially supra-condylar fractures, "T" fractures, tibial plateau fractures and distal spiral fractures of the femur. The blade section is driven into the condylar area and the plate screwed to the femur or tibia for a simple, effective fixation.

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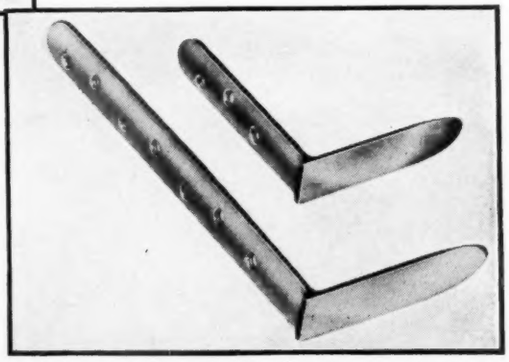
In 8″ (adult) and 5″ (children) sizes for geometric osteotomies of the hip. The sharp end is driven through the trochanter into the head of the femur and the spline is attached to the shaft, unbent, in a direct vertical weight bearing position. In 3″ size for fractures of the surgical neck of the humerus and for humeral osteotomies. The spline is bent to the appropriate angle driven into the humeral head and screwed to the shaft. The 1″ finger spline is for fractured metacarpals and metatarsals and can be bent as desired.



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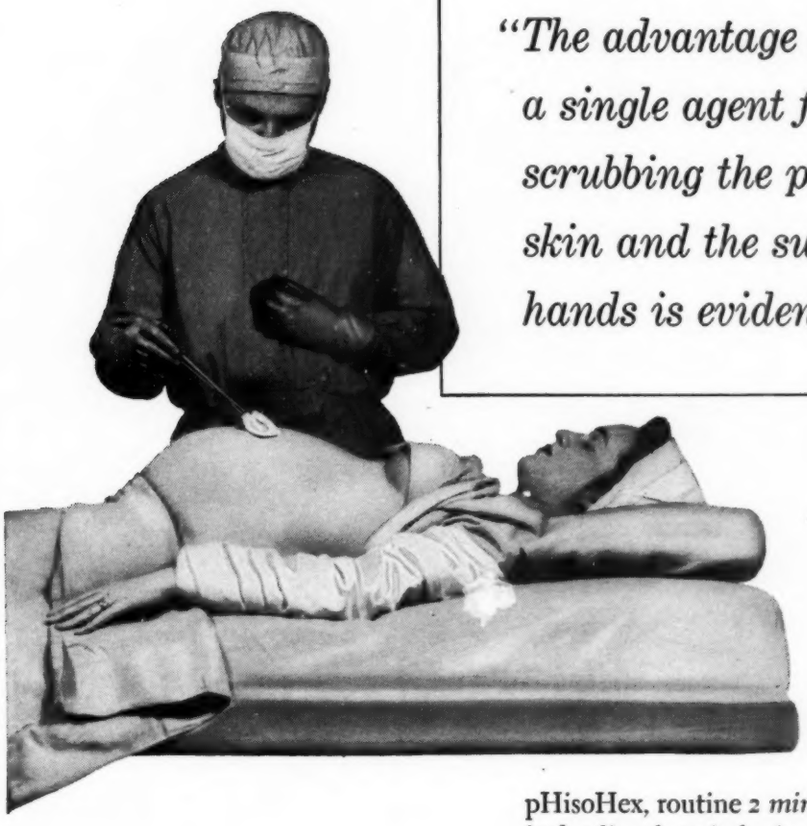

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1. Artz, C. P., Pulaski, E. J., and Shaeffer, J. R.: *U. S. Armed Forces Med. Jour.*, 2: 819, May, 1951.

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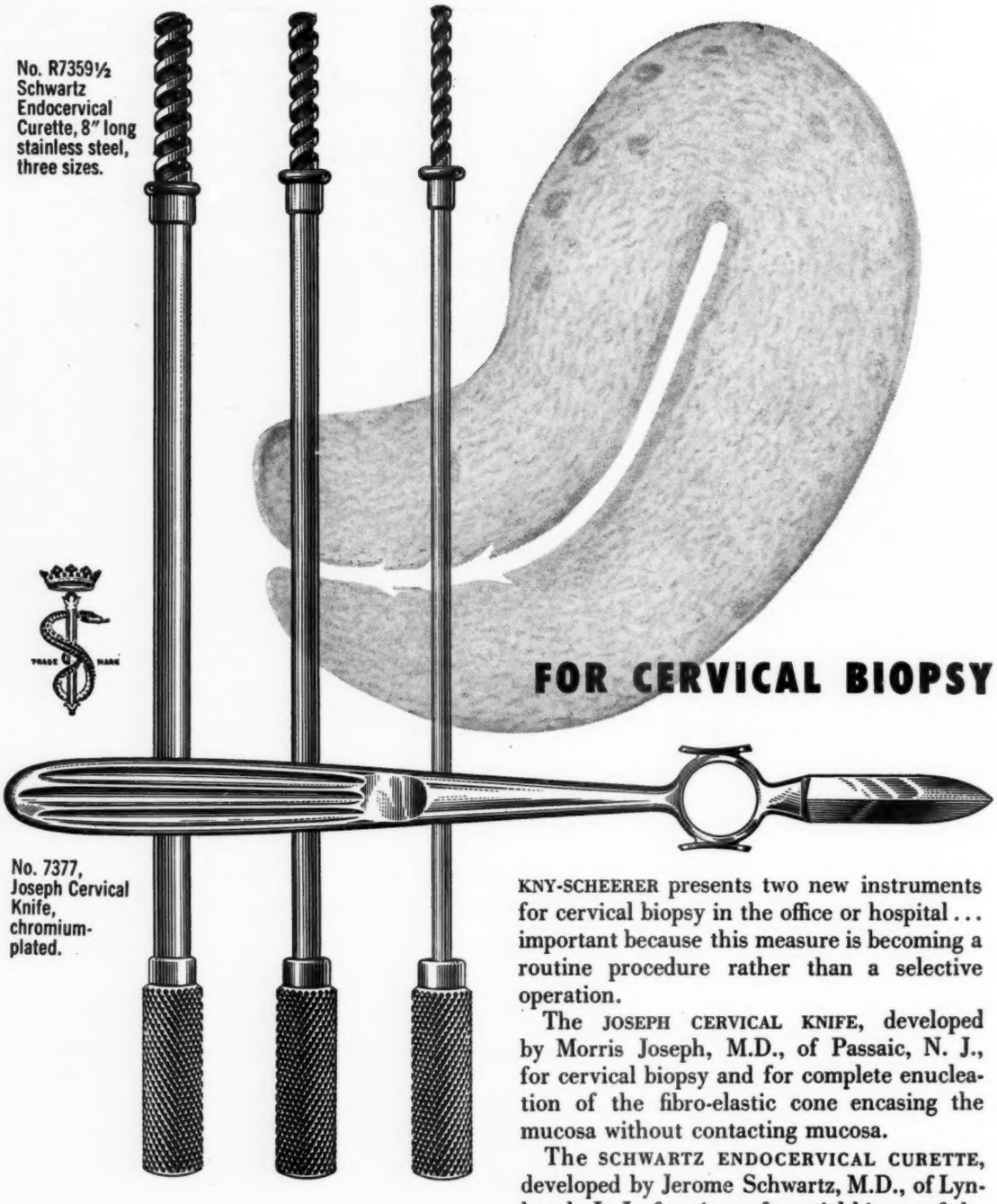

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No. 7377, Joseph Cervical Knife, chromium-plated.

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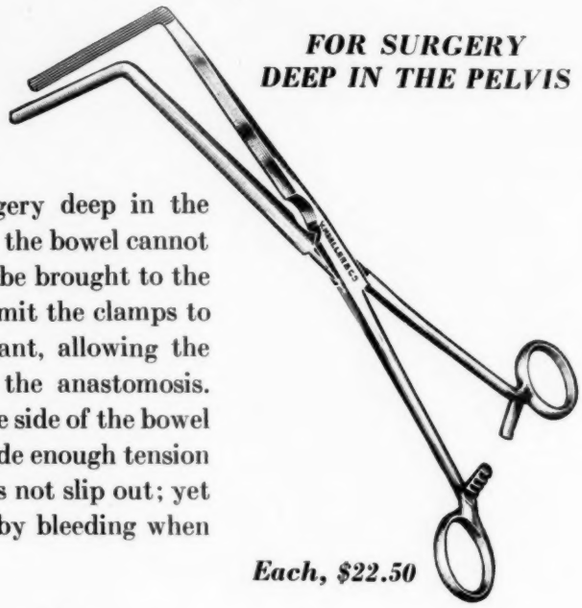

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STAINLESS STEEL

A new clamp especially helpful for surgery deep in the pelvis, or places where space is limited and the bowel cannot be mobilized sufficiently or is too short to be brought to the surface for anastomosis. Long handles permit the clamps to be brought into apposition by the assistant, allowing the surgeon ample room in which to make the anastomosis. Rubber tubing is used over the jaws on the side of the bowel to be anastomosed: the clamp blades provide enough tension so that, with ordinary care, the bowel does not slip out; yet circulation is not impaired, as evidenced by bleeding when the clamp is removed.

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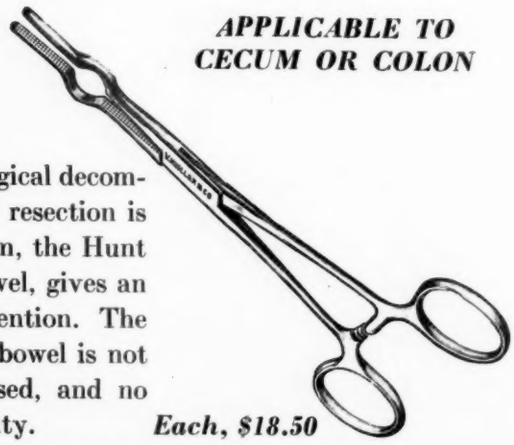

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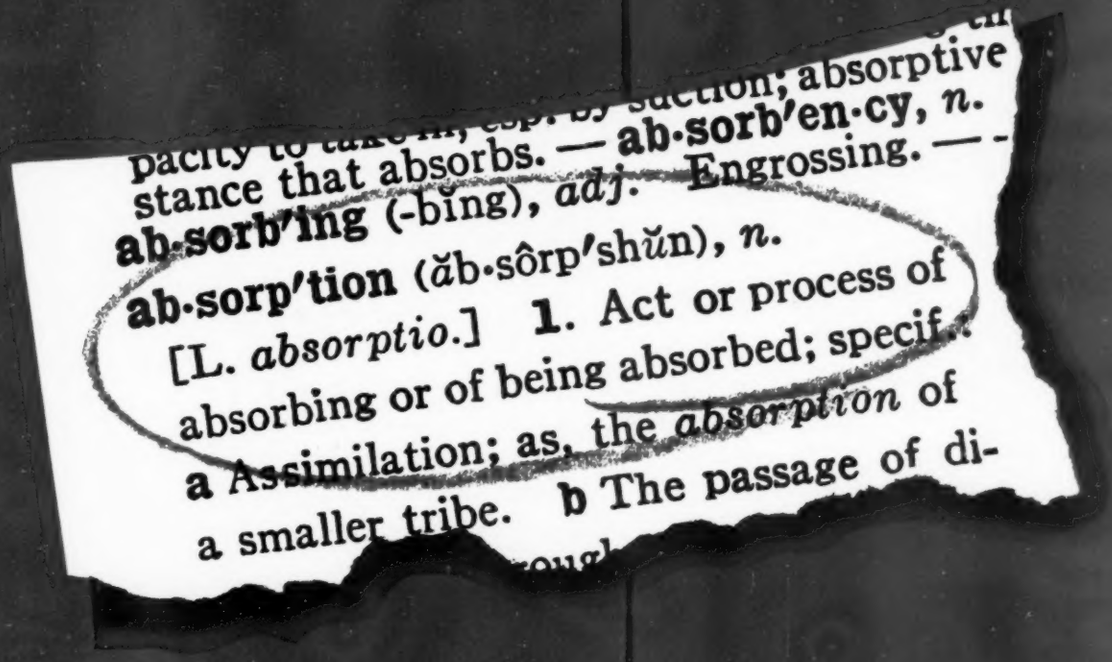
stance that absorbs. — ab·sorb′en·cy, n.
ab·sorb′ing (-bĭng), adj. Engrossing. —
ab·sorp′tion (ăb·sôrp′shŭn), n.
[L. absorptio.] 1. Act or process of
absorbing or of being absorbed; specif.:
a Assimilation; as, the absorption of
a smaller tribe. b The passage of di-

to absorb and be absorbed

For efficient hemostasis — When cut to shape and pressed against oozing capillary surfaces, Gelfoam promotes clot formation and actively *absorbs* up to 45 times its weight in blood.

For safe hemostasis — When left *in situ*, Gelfoam *is absorbed* in 20 to 45 days with virtually no cellular reaction.

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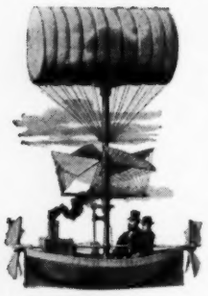

1870

"A novel machine intended for aerial navigation," from a Bettmann Archive print. (No flight information is given!)

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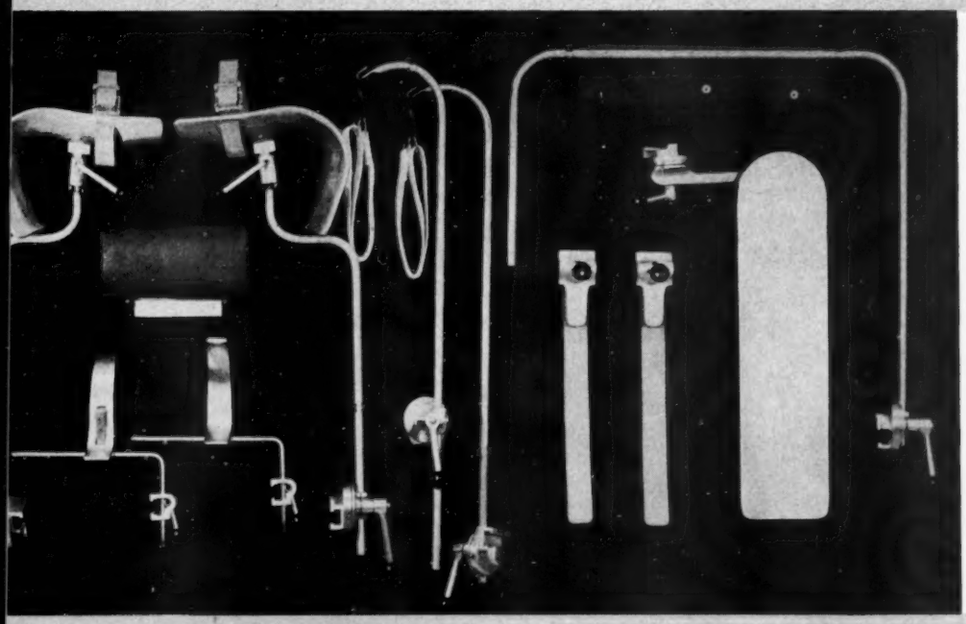

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The Ritter Universal Table, Model B, Type 2, shown above, can be completely equipped for all the demands of medium surgery work. The Universal Table includes as standard equipment adjustable headrest, perineal cut-out, irrigation pan, adjustable knee rest, stirrups and hand wheel operated tilt mechanism. Motor-elevated, the table moves quietly, smoothly from 26½″ to a maximum of 44½″.

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To assist in operative procedures, optional equipment, shown above, includes arm board support, ether screen, shoulder supports, wrist restraints, knee crutch set, strap hanger crutch set, and cushions for Sims position in proctologic work.

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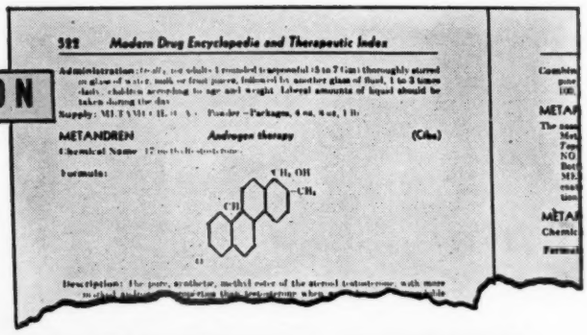
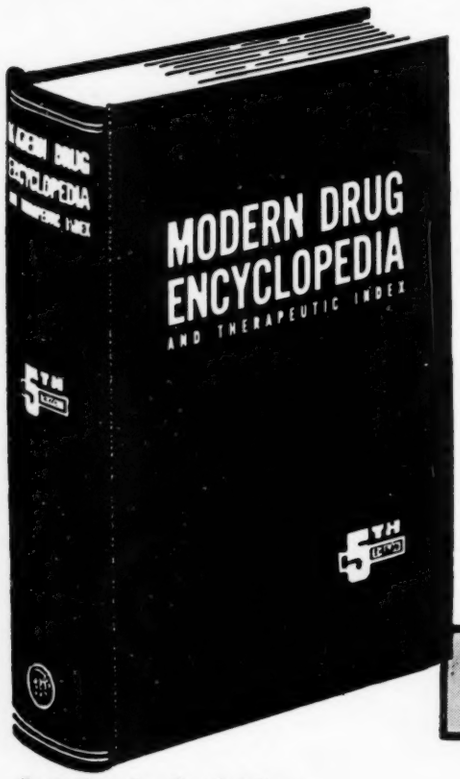

522 Modern Drug Encyclopedia and Therapeutic Index

METANDREN Androgen therapy (Ciba)

Chemical Name

Formula:

Description:



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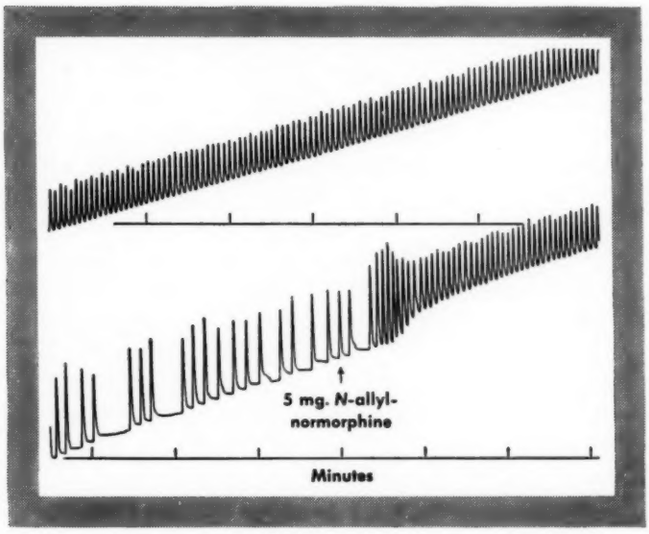

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Literature available

[1]Eckenhoff, J. E., Elder, J. D., and King, B. D., *Am. J. Med. Scs.* **223**:191, February 1952. [2]Eckenhoff, J. E., Hoffman, G. L., and Dripps, R. D., Annual Meeting of the American Society of Anesthesiologists, Washington, D. C., Nov. 8, 1951.

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MEAT... and our changing national caloric requirement

Because of labor-saving devices in present-day occupations, automotive transportation, and fewer hours in the working day, and because population concentrations are moving from rural to urban areas, the resulting changes in living habits have sharply decreased the caloric needs of millions of Americans.[1] Whereas many persons formerly expended 3,500 calories or more daily, today their expenditure may be only 2,500 calories per day. Despite this reduction in caloric requirements, the needs for most essential nutrients—proteins, vitamins, and minerals—remain largely unchanged.

Hence, today more than ever before, foods should be chosen for their high content of essential nutrients in relation to the calories they provide. Foods of high nutritive quality, such as meat, therefore, assume particular importance in the changing American diet.

That meat supplies an abundance of essential nutrients in relation to calories is evident from the table given below. Note that the percentage contribution of the recommended daily dietary allowances made by each nutrient is greater or much greater than the percentage contribution made by the calories.

Calories and Nutrients Provided by 6 oz. of Average Cooked Meat and Their Percentages of Recommended Daily Dietary Allowances

	Amounts per 6 oz. of Average Cooked Meat*	Percentages of Recommended Daily Dietary Allowances N.R.C.†
Calories	454	19%
Protein (biologically complete)	44 Gm.	63%
Iron	5.6 mg.	47%
Phosphorus	4.4 mg.	28%
Niacin	9.5 mg.	79%
Riboflavin	0.44 mg.	24%
Thiamine	0.50 mg.	42%

*Average number of calories and average amounts of the chief nutrients furnished by six-ounce servings of cooked meat (averages of amounts furnished by six ounces each of cooked beef, lamb, pork, and veal).[2]

†National Research Council's recommended daily allowances for a sedentary man (154 lb.).

In addition to the nutrients listed above, meat contributes noteworthy amounts of the vitamins biotin, choline, folic acid, inositol, pantothenic acid, pyridoxine, and the newly discovered vitamin B_{12}.

1. King, C. G.: Trends in the Science of Food and Its Relation to Life and Health, Nutrition Rev. *10*:1 (Jan.) 1952.

2. Watt, B. K., and Merrill, A. L.: Composition of Foods—Raw, Processed, Prepared, in Agriculture Handbook No. 8, United States Department of Agriculture, Bureau of Human Nutrition and Home Economics, 1950.

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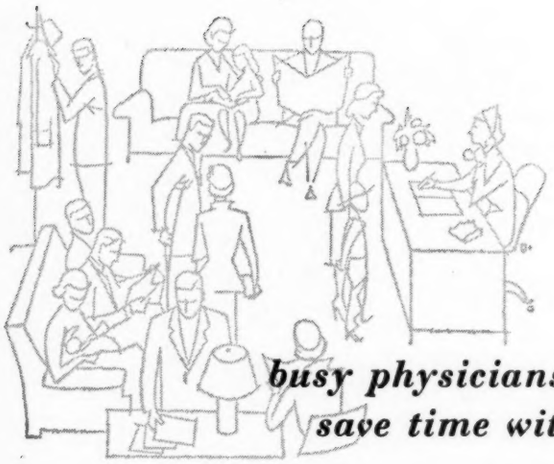

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A PRACTICAL JOURNAL BUILT ON MERIT

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Editorial

THE SURGICAL CONSCIENCE

IF any practicing surgeon in this country does not know in some detail the medical life of Dr. Rudolph Matas of New Orleans, that surgeon is a poorly informed man indeed.

In our opinion, and this is purely personal, Dr. Matas is the outstanding surgeon of this country of the past six decades. His reputation and fame are world wide. He is a true friend. We have been honored for the past quarter of a century in having had him on our Editorial Board.

The Bureau of New Orleans News sent us a news item concerning Dr. Matas, and quoted from a reply he made in accepting his latest honor.

You will note Dr. Matas defines what in his judgment makes for a real surgeon. We believe every mentally honest physician will echo Dr. Matas' words. Therefore, we quote almost in full the announcement which we received:

"In New Orleans a fellowship in the American College of Surgeons was bestowed upon Dr. Rudolph Matas, professor emeritus of surgery at Tulane University. The fellowship was conferred by Dr. Alton Ochsner, president of the American College of Surgeons and William Henderson, Professor and Director, Department of Surgery, Tulane University.

"Dr. Matas, who served as president of the College of Surgeons in 1925 and who is one of the founders, is the first man ever intimately associated with the College of Surgeons to receive the award.

"In acknowledging the award Dr. Matas said: 'It is very gratifying to me to have this award conferred upon me and it is especially gratifying to have Dr. Ochsner, my successor as Professor of Surgery at Tulane and now President of the College of Surgeons, to confer it.'

"He said, too, that it has always been the tradition of the American College of Surgeons 'to build up men fitted to carry on the flaming torch of progress handed to them by their predecessors . . . to this end, it has and is endeavoring to stimulate the cultivation of a surgical conscience. By this we mean not merely a consciousness of what is wrong with our technics, but with the morals that guide them. The surgical conscience is the fruit of knowledge, training and culture and in the science and art of surgery, and the purely technical sense, can be developed and highly cultivated.

'The moral conscience,' continued Dr. Matas, 'is that intangible something, the still, small voice that, rising from the depths of our innermost selves whispers its warnings when we are doing wrong. It is the spirit of ancestral generations which, whether good or bad, is housed in us while in transit to our successors. Conscience is therefore an inheritance; and the seed of good or evil is implanted in us with our birth. Like other seeds, it will thrive when well cultivated, or it may atrophy or perish when it is planted in sterile soil. It is therefore influenced, for better or for worse, by the conditions and laws of its environment.

'The majority of those born of normal, healthy, honest and decent parents have the right seed sown in them when they are born.

But conscience is erratic. Some people it misses altogether. They are born without the spark that brings it into existence. In others it is so small and atrophied that it becomes like the appendix, a useless and dangerous nuisance which might as well be cut out altogether.

'When a man wakens to the ring of his conscience, gets to work and starts to put his house in order, we may say he has character. Character is the will to put into action what the voice of conscience has roused in him. Conscience, without the will to act upon its biddings, is powerless and might as well be dead.

'When a man has neither conscience nor character, he cannot be a good man, and if he is not a good man he cannot be a good surgeon. And no matter how skillfully he may take out appendices, and gall bladders, resect stomachs, do hernias, and other fine jobs in surgery, we don't want him, and he need not apply for Fellowship in the American College of Surgeons, for he will not be accepted.'"

Can one think of or write a better creed for a surgeon? If all surgeons lived up to this creed and cultivated a surgical conscience, their standing in the public eye would be enviable and the quality of their work almost beyond criticism.

T. S. W.

Original Articles

STENOSED ARTERIOPATHY OF THE HUNTER CANAL AND LOOP OF THE ADDUCTOR MAGNUS

EDUARDO C. PALMA, M.D.
Montevideo, Uruguay

IN this communication we are presenting a type of arteritis of the legs which by their individual pathologic and clinical characteristics constitute, in our judgment, a new clinical entity. We call it stenosed arteriopathy of the Hunter canal and loop of the adductor magnus since it has its beginnings in this precise anatomic location and lacks additional inflammatory characteristics. We have already made known this disease in recent publications.[1–4] We consider that within the stenosed arteriopathy of the Hunter canal the distinction must be made between the two different types which we call respectively, typical (juvenile and adult) and presenile.

Considerations. Basically in earlier observations we took into consideration the clinical picture of *typical* stenosed arteriopathy of the Hunter Canal in the following general features:

The age runs to about forty-five years. The patients are physically well developed men, very often athletic and persons of exceptional physical ability. They present a syndrome of circulatory insufficiency in one or both legs, progressive changes and intermittent claudication, generally unilateral. From the clinical point of view it presents the customary picture seen in arteritis of the legs of undetermined origin and often erroneously called Buerger's disease or thromboangiitis. However, the arterial lesions begin in the femoral artery and Hunter canal, affecting a segment but leaving the rest of the circulatory system healthy, at least for a period of time. Consequently, the intermittent claudication produces pain and cramps in the calf but not in the foot, toes or ankle. These patients also present the characteristics of a simultaneous diminishing or disappearance of the pulsations of the dorsalis pedis, posterior tibial and popliteal arteries. There is often pain on severe pressure on the Hunter canal or popliteal artery (and by means of Buerger's examination, by putting the patient decubitus, ventral, with the leg flaccid and semi-flexed.) The oscillometric index diminishes or disappears fairly high in the leg, from the lower third of the thigh. We call attention to the contrast between the decrease of the oscillometric reading of the leg and the moderate peripheral circulatory insufficiency of the foot and toes. This is due to conservation of the circulation of the trunk from the popliteal artery to the periphery.

Arteriography also shows us these lesions as well as the portional changes in the main trunk. The decrease in the diameter of the arterial lumen or its obliteration is found in the superficial femoral artery at the Hunter canal level or at the beginning of the popliteal artery. In advanced cases the stenosis may extend above and beyond the superficial femoral artery, and furthermore, in serious cases it can reach the femoral profunda. It is to be noted that the rest of the arterial system of the leg remains undamaged (from the thigh to the foot).

We have often abstained from arteriography because since 1939[5] we can make the diagnosis of these troncular segmentary lesions without arteriography, based on the aforementioned clinical data.

The disease is customarily bilateral although generally it goes unobserved in the other side which has lesser symptoms. In addition, the disease is found to be localized in the legs without detecting signs of insufficiency in other arteries (retina, coronary, kidney). Another characteristic of this disease is that it is not episodal but is a chronic and progressive process.

Complications can be produced, more or less acute, with peripheral aggravation of circulatory insufficiency. They can be produced by traumatisms and especially by arterial thrombosis originating from diverse causes (cardiac insufficiency, acute dehydration, alteration of normal blood characteristics, intervening infectious diseases). These complications are independent of the original disease but they can give the false appearance of the evolutionary stage of the initial disease process. (Tables I and II.)

TABLE I
MACROSCOPIC PATHOLOGIC LESIONS IN TYPICAL FORM

Case No.	Leg	Arterial Lesions				Localization			Macroscopic Lesions			Venous Lesions
		Bilateral	Unilateral	Unisegmentary	Multisegmentary	Hunter Canal	Superficial Femoral Artery above Hunter Canal	Popliteal Artery	Arterial Stenosis	Arterial Obliteration	Periarterial Fibrosis	
I	Rt.	Yes	–	Yes	–	×	–	–	×	–	×	No
	Lt.			Yes	–	×	–	–	–	×	×	No
II	Rt.	Yes	–	Yes	–	×	×	–	×	–	×	No
	Rt.											
	Lt.			Yes	–	×	–	–	×	–	×	No
III	Rt.	Yes	–	Yes	–	×	×	–	–	×	×	No
	Lt.			Yes	–	×	–	–	–	×	×	No
IV	Rt.	Yes	–	Yes	–	×	–	×	–	×	×	No
	Lt.			Yes	–	×	–	–	×	–	×	No
V	Rt.	Yes	–	Yes	–	×	–	–	×	–	×	No
	Lt.			Yes	–	×	–	–	×	–	×	No
Total:		5	0	10	0	10	2	1	6	4	10	0

The clinical picture of the *presenile* form of stenosed arteriopathy of the Hunter canal is as follows:

These patients are men of from forty to sixty years of age, who also present a syndrome of circulatory insufficiency of one or both legs with the same general characteristics of the typical form. However, they differ not only in the age limits but also in the slower evolution of circulatory disturbances of the leg and by the frequent existence of distinct signs of arteriosclerosis in the rest of the circulatory system. There is one sharp disparity between the large extent and great importance of the arterial lesions of the legs, especially at the Hunter canal level. These lesions are customarily bilateral, and the little emphasis of the diffuse lesions of arteriosclerosis which exist in other parts of the organism are usually found in the customary limits for the given age. The presenile type of the stenosed arteriopathy of the Hunter canal is more frequent than the typical.

TABLE II
MICROSCOPIC ARTERIAL LESIONS IN TYPICAL FORM

Arteriectomy		Fibrosclerosis of Tunica Media	Proliferant Endoarteriopathy	Thrombosis of Remaining Lumen
Case No.	Leg			
I	Lt.	Yes	Yes	Yes
II	Rt.	Yes	Yes	No
III	Lt.	Yes	Yes	Yes
	Rt.	Yes	Yes	Yes
IV	Rt.	Yes	Yes	Yes

We have found the pathologic lesions by means of macroscopic observations during operation and in the microscopic studies of arterial segments by surgical excision. We have intervened surgically in patients in relatively early stages, generally before the appearance of gangrenous lesions or peripheral ulcerations, thus avoiding the infectious lesions of complications which disguise the initial pathologic changes. This contrasts with current pathologic descriptions which have been made on amputated fragments or from autopsy where complications had already set in, such as ulcers, gangrenous patches and multiple vascular thrombosis.

In addition, we have operated on the Hunter canal at the opposite side, which has permitted us to verify the initial stage of the lesion at the level of the vessels. This has been of great help in interpreting this disease.

In typical stenosed arteriopathy of the Hunter canal periarterial fibrosis exists of the

1 2

FIG. 1. Arteriography showing the accentuated reduction of the lumen of the superficial femoral artery in its entire length, especially in the Hunter canal.

FIG. 2. Arteriography showing total obliteration of the superficial femoral artery at the level of the loop of the adductor magnus.

superficial femoral artery in the Hunter canal and the loop of the adductor magnus and in the origin of the popliteal artery. The fibrosis develops between the arterial wall and its sheath, between this and the adjacent veins, between the sheath and common vascular sheath, and between this and the wall of the Hunter canal and loop of the adductor magnus. Furthermore, there is a thickening and hardening of the wall of the artery which appears paler in this area (pale pink instead of reddish). At the beginning these changes involve only a portion of the circumference of the vessel, generally the internal and posterior part. Posteriorly these lesions extend lengthwise and also circularly, involving the entire circumference of the vessel in advanced cases. The lumen of the artery is reduced but retained for rather a long time. Initially there is no arterial thrombosis. Thrombosis is produced after an important period of evolution of the lesions and constitutes local complication of the lesions when they are already advanced.

Parietal enlargement is produced especially by increase of the intima at the level of the subendothelial layers where there are intense conjunctive proliferation, disorganization in areas of the elastica interna, scanty penetration of capillaries, fibrosclerosed transformation of the proliferated conjunctival tissue and its partial degenerative changes. In the tunica media the lesions are less defined, producing hypertrophy of the conjunctival tissue and its sclerosed transformation with degeneration of the muscle fibers.

After a period of changes of the disease it produces progressive fibrosclerosive transformation of the lesions of the tunica media and tunica intima with which the artery shrinks longitudinally and circularly, diminishing appreciably its external diameter in addition to its lumen. (Fig. 1.)

In the lesions of prolonged changes thrombosis of the retained portion of the lumen is almost positive, producing obliteration of the vessel (Fig. 2) and consecutive organization of the

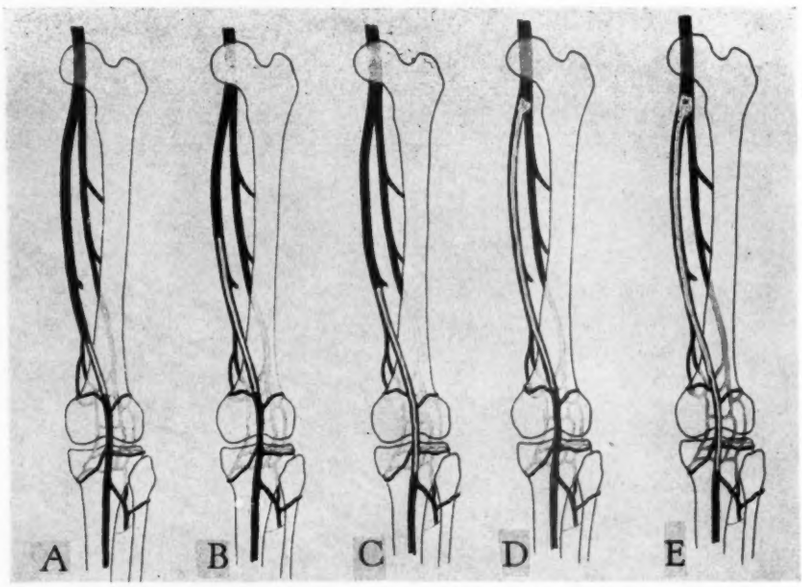


FIG. 3. A, obliteration in the Hunter canal; B, proximal progress, obliteration of the lower half of the superficial femoral artery; C, distal progress, obliteraation of the popliteal artery; D, proximal progress, obliteration to the common femoral artery; F, proximal and distal progress, obliteration from the common femoral to the popliteal. Outline showing the principle localization of the stenosed arteriopathy in the Hunter canal and its various anatomic types according to their ascending or descending progressions.

thrombus by means of conjunctive vascular buds which emerge from the tunica intima. Eventually it evolves toward sclerosis.

The stenosed or obliterated lesion of the lower third of the superficial femoral artery progresses lengthwise, especially proximally. It progresses to its mid-third and upper third possibly reaching the femoral artery. Its distal progress is less frequent and often less extensive, and involves the popliteal artery. The thrombotic complication may produce a hastening and more total extension of the lesions in their centrifugal and centripetal progress. (Fig. 3.)

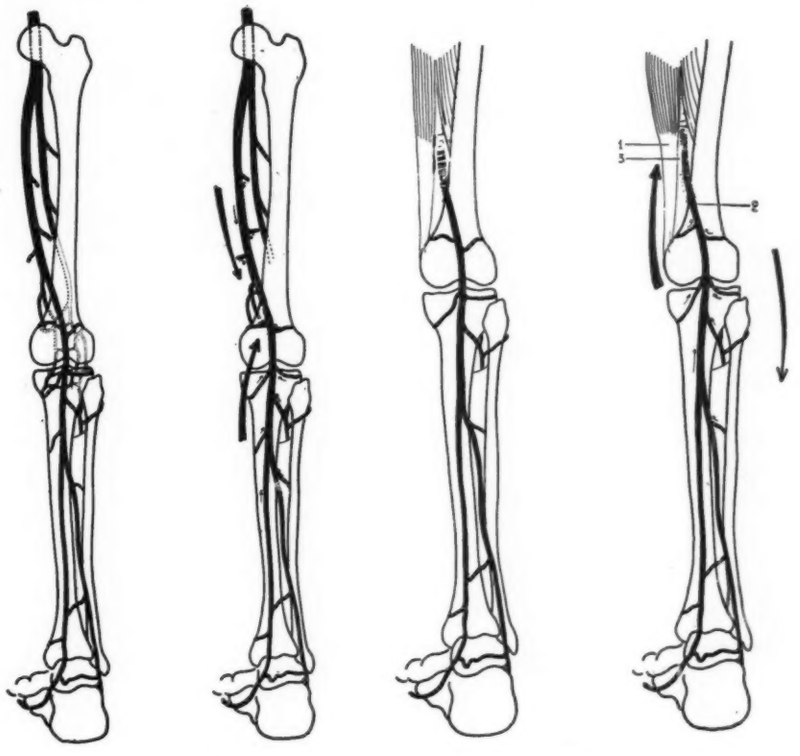
The venous trunks do not present thrombosis, nor are there lesions within their own walls. Only the periarterial fibrosis already described exists which extends to the proximal area of the venous trunk. In these patients the rest of the arterial system remains undamaged for a long time.

Later the stenosis or obliteration of the femoral artery produces secondary changes in the peripheral arterial system of the limb. This secondary repercussion on the peripheral arteries is produced for three reasons: (1) The peripheral hyphemia caused by the stenosis of the femoral artery produces trophic changes on all the tissues, not only the skin, muscles and aponeuroses but also on the peripheral vessels, especially the distal arteries and arterioles which undergo an altering process. (2) The cicatricial, longitudinal retraction of the femoral artery produces longitudinal hypertonia of the entire arterial system of the leg, as much in the central vessels as in the peripheral which diminishes their functional efficiency and causes loss of blood.[6] The periarterial fibrosis fastens the artery to the Hunter canal causing its capacity for moderate longitudinal slipping to disappear, a process important to any artery. This process causes continuous traumatism and longitudinal hypertension to the popliteal artery during the motions of walking. With the effort of each step, the popliteal artery is submitted to the normal distal traction (produced by the extension of the leg and the continuation of the popliteal artery with the peripheral vessels) and at the same time its proximal extremity is anchored to the loop of the adductor magnus and the Hunter canal.

In these patients the arterial lesions are limited exclusively to the legs, leaving the rest of the arterial system untouched.

On the other hand, the lesions are usually bilateral and the femoral artery of the opposite

side contains lesions at the level of the Hunter canal and loop of the adductor magnus. These lesions are present but to a much lesser degree, and often present periarterial fibrosis only or together with limited parietal thickening. This thickening involves a part of the circumference and have their source at the popliteal artery (Hunter canal and loop of the adductor magnus) where there is intense periarterial fibrosis. At this level the artery is rigid, often with an externally reduced diameter produced by the sclerosing retraction of its walls. The lumen of



4 5

FIG. 4. In this illustration the arrows show the retracting force, originating in the area of the stenosed arteriopathy, which produces the permanent longitudinal hypertension in the arterial system of the leg, upward as much as downward.

FIG. 5. The arrows point out the longitudinal traction in opposite directions produced in the extension of the leg on walking as a result of the periarterial fibrosis which attaches the femoral artery to the Hunter canal. The longitudinal slipping of the artery disappears and then the adductor magnus tendon and the Hunter aponeurosis transmits its ascending traction to the arterial trunk; instead the popliteal artery suffers a longitudinal hypertension because of the descending traction produced by the simultaneous displacement of the arteries and muscles of the leg. (1) adductor magnus tendon; (2) popliteal artery; (3) loops of the adductor magnus and Hunter canal.

of the artery and generally begins at the loop of the adductor magnus at the postero-inferior area beside the tendon; from there it proceeds upward. (Figs. 3 to 5.)

In the presenile form of the disease the pathologic lesions are more complex than those in the typical and present similarities and differences. (Tables III and IV.)

As in the typical, the dominant lesions are segmentary and localized at the femoral artery the vessel is greatly diminished or disappears by means of productive endoarteriopathy and frequent central thrombosis already organized. The lesions of the mesoartery and of the tunica interna are similar to those of the typical form of the disease in their principal aspects, but the fibrosis and above all the sclerosis of both tunicae are much greater. Furthermore, there are areas of apparent atheromatosis often with calcareous impregnations.

TABLE III

MACROSCOPIC PATHOLOGIC LESIONS IN PRESENILE FORM

Case No.	Arterial Lesions											Venous Lesions
	Leg	Bilateral	Unilateral	Unisegmentary	Multisegmentary	Localization: Hunter Canal	Localization: Superficial Femoral Artery above Hunter Canal	Localization: Popliteal Artery	Macroscopic Lesions: Arterial Stenosis	Macroscopic Lesions: Arterial Obliteration	Macroscopic Lesions: Periarterial Fibrosis	
I	Rt.	Yes	–	Yes	–	×	×	×	×	–	×	No
	Lt.			Yes	–	×	–	–	×	–	×	No
II	Rt.	Yes	–	Yes	–	×	–	×	–	×	×	No
	Lt.			Yes	–	×	×	×	–	–	×	No
III	Rt.	Yes	–	——	——→——	No surgical		——→——	Exploration		——→——	——→
	Lt.			Yes	–	×	×	×	–	×	×	No
IV	Rt.	Yes	–	——	——→——	No surgical		——→——	Exploration		——→——	——→
	Lt.			Yes	–	×	×	×	–	×	×	No
V	Rt.	Yes	–	——	——→——	No surgical		——→——	Exploration		——→——	——→
	Lt.			Yes	–	×	×	×	–	×	×	No
VI	Rt.	Yes	–	——	——→——	No surgical		——→——	Exploration		——→——	——→
	Lt.			Yes	–	×	–	–	–	×	×	No
VII	Rt.	Yes	–	Yes	–	×	×	×	–	×	×	No
	Lt.			——	——→——	Previous surgery		——→——	Other Hospital		——→——	——→
VIII	Rt.	Yes	–	Yes	–	×	–	×	–	×	×	No
	Lt.			Yes	–	×	×	–	×	–	×	No
IX	Rt.	Yes	–	——	——→——	Amputated		——→——	Other Hospital		——→——	——→
	Lt.			Yes		×	–	–	×	–	×	No
X	Rt.	Yes	–	Yes		×	–	–	×	–	×	No
	Lt.			——	——→——	No surgical		——→——	Exploration		——→——	——→
Total:		10	0	13	0	13	7	7	6	7	13	0
				Ignored 7		Ignored 7			Ignored 7		Ignored 7	Ignored 7

The central thrombus is organized but its fibrosis and sclerosis are very well defined, which often makes differentiation difficult between it and the productive endoarteriopathy which is also sclerosed. The existence of capillaries and newly formed small vessels in the thrombus constitutes a guide for the differentiation between it and the endoarteriopathy which has scanty vessels or none at all.

TABLE IV
MICROSCOPIC ARTERIAL LESIONS IN PRESENILE FORM

Arteriectomy		Fibrosclerosis of Tunica Media	Proliferant Endoarteriopathy	Thrombosis of Remaining Lumen
Case No.	Leg			
I	Rt.	Yes	Yes	No
II	Rt.	Yes	Yes	Yes
IV	Lt.	Yes	Yes	Yes
V	Lt. (aneurysm)	Yes	Yes	Yes
VI	Lt.	Yes	Yes	Yes
VII	Rt.	Yes	Yes	Yes
VIII	Rt.	Yes	Yes	Yes
	Lt.	Yes	Yes	No

These newly formed vessels do not reconstruct the arterial channel and have no value in re-establishing the circulation of the limb. They serve only to irrigate locally the newly formed conjunctival tissue which has penetrated the thrombus.

Sometimes there is a fissure in the central or lateral part of the thrombus which in reality constitutes a route for the passage of blood toward the periphera and continues with the lumen of the arterial trunks which are along the stenosed area. This does not deal with recanalization by means of a newly formed vessel but of a very limited persistence of the original lumen of the artery.

The arterial lesions extend centripetally and centrifugally, or in both directions at the same time, and prolonged, reaching a level in which the arterial trunk appears normal or subnormal.

The venous trunks do not present lesions, except scanty fibrosis in the vicinity of the artery.

General examination of the arterial system in these patients usually shows discrete arteriosclerosis, more or less diffused. However, these lesions are very small in relation to the intensity of the Hunter canal.

We believe that these presenile cases of stenosed arteriopathy of the Hunter canal were initially cases which had small lesions of chronic evolution for which reason they were inadvertently overlooked clinically. They manifested themselves too late when the general phenomena of arteriosclerosis and the lipoidic overload of the circulatory system began (this appears in almost everyone after forty or fifty years of age).

The local pathologic lesions result from the aging of the initial lesion (sclerosis, calcification) plus the initiation or the predominance at this level of the general phenomena of arteriosclerosis.

Pathogenesis. The origin of these lesions is not yet known. However, careful observation of our cases permits us to establish the following facts: (1) The lesions begin in the Hunter canal. (2) In the incipient cases the lesion begins beside the tendon of the adductor magnus or at its loop. (3) The predominant incipient lesions are the periarterial fibrosis and the nodular interparietal fibrosis, which means that they are the more external rather than the central lesions of the lumen. (4) This disease is manifest only in the male and does not appear in the female, in whom anatomically the femur is more oblique and the Hunter canal larger.

These facts support our theory in respect to the pathogenesis of the disease. In some men the Hunter canal is somewhat narrower than is customary or with the artery in very close contact with the tendo-aponeurotic formations as a consequence of a constitutional characteristic. Systolic expansion of the vessel produces microtraumatisms on the arterial wall at the level of this narrow loop or the Hunter canal. These repeated traumatisms generate the aforementioned lesions at the end of a rather long period of time.

Obliteration of the subclavian artery in cases of a long cervical rib and obliteration of the axillary artery in cripples using unpadded crutches are familiar examples of obliterated arteriopathy of traumatic origin produced by

a parietal systolic microtraumatism against an external superficial resistance. The pathologic lesions are similar to those of stenosed arteriopathy of the Hunter canal.

Development and Prognosis. The unchallenged, untreated disease in its spontaneous evolution is progressive. The thromboses, local, centripetal and especially peripheral, begin the cycles of aggravation of circulatory insufficiency of the leg, which often develops into gangrene.

The seriousness of the lesion is more severe when the reduction of the diameter of the lumen of the vessel is greater and the stenosis has a greater longitudinal extension.

In this sense, serious aggravations are presented by (1) upward progressive obliteration of the superficial femoral artery to the femoral artery denying the blood supply to the profound femoral artery and diminishing further blood supply to the entire leg; (2) the downward progressive obliteration to the popliteal artery nullifies the numerous articular arteries of the knee, very useful for the maintenance of the anastomotic circles and the re-establishment of peripheral trunk circulation; and (3) both lesions at the same time.

Therapy. We have had very good results with the surgical treatment of these lesions.

CASE REPORTS

The following are the observations obtained in the past two and a half years, putting aside the cases seen previously during the sixteen years in which we have been studying peripheral arteritis by dealing with imperfect observations prior to the knowledge of this new disease.

Typical Form

CASE I. M. C., forty-one years of age, had suffered from intermittent claudication of the left leg for a year and a half and was unable to walk more than 50 meters because of pain in the calf. On examination he was found to have bilateral arterial insufficiency syndrome of the legs, greater in the left side, with arteritic erythromelia of the toes and feet, coldness, trophic changes, disappearance of the popliteal, posterior tibial and dorsalis pedis pulses, and greatly diminished angle of circulatory sufficiency. The oscillometric index disappeared in the left leg and diminished in the lower third of the left thigh and right leg and thigh. The rest of the circulatory system was normal.

Surgical intervention on August 20, 1948, consisted of liberation of the left femoral, popliteal arteries, arteriectomy of the ending of the superficial femoral and left lumbar sympathectomy.

Pathologically, there were large periarterial fibrosis in the Hunter canal, parietal sclerosis of the artery, productive endoarteriopathy and an organized central thrombus. The arteries up and down this area were macroscopically unchanged. The veins were normal.

Postoperatively there was marked improvement of the left leg but there were still symptoms in the right.

Surgery upon the right side on July 26, 1949, effected liberation of the right femoral-popliteal arteries. The veins presented no lesions. There were large periarterial fibroses of the Hunter canal, and hardening of the femoral artery with its walls enlarged but with its lumen intact in part and pulsating.

Improvement was very pronounced and steady, with disappearance of the arteritic erythromelia of the toes and feet and peripheral coldness, etc. The patient has fully recovered without intermittent claudication and is able to work all day without discomfort.

CASE II. M. D. P., thirty-four years of age, suffered from intermittent claudication of his right leg with pain in the calf. He was unable to walk more than 200 meters. On examination there was disappearance of the popliteal, posterior tibial and dorsalis pedis pulses; the angle of circulatory sufficiency was greatly diminished; there was arteritic erythromelia of the toes and feet and disappearance of the oscillometric readings in the lower third of the right thigh, diminishing in the mid-third and somewhat diminished in the upper third. In the left side there was only a discrete diminishing in oscillometric readings from the lower part of the thigh downward. The rest of the circulatory system was normal.

Operation was performed on November 19, 1948, effecting bilateral femoral-popliteal arterial liberation, as well as arteriectomy of the terminus of the superficial femoral for an extension of 2 cm.

Pathologically, there was a large periarterial fibrosis of the Hunter canal in both sides. In the right side there was a markedly productive endoarteriopathy of the tunica interna which had almost caused the total disappearance of the lumen of the vessel at the level of the open-

ing of the adductor magnus; the tunica media contained clear fibrosis. In the left side the artery at the Hunter canal had its walls enlarged and hardened, especially at the level of the adductor magnus, with its lumen reduced but retained in most part. Above and below this area the arteries were normal. The veins did not present lesions. (Fig. 6.)

Development was favorable, with the patient showing evident improvement of the disorder. In December, 1948, a right lumbar sympathectomy was performed. At present intermittent claudication appears only at 600 meters of walking at the maximum and the patient's improvement continues markedly.

CASE III. M. M. V., forty-six years old, suffered from intermittent claudication of his right leg at 200 meters, with pain and cramping in the calf for three months. He suffered for twenty months with pain in the thighs on long walks and later with dehydration and paresthesia of the feet. On examination there was a syndrome of moderate bilateral arterial circulatory insufficiency, greater on the right, bilateral disappearance of the pulses and bilateral disappearing oscillometric index with near-disappearance in the lower third of both thighs and slight diminishing in the middle third of the right thigh. There were no trophic disturbances in comparison with the coldness of the right foot and a positive Buerger reaction. There were no changes in the rest of the circulatory system.

The patient was operated upon March 22, 1949, at which time right lumbar sympathectomy, liberation of the femoral-popliteal arteries and arteriectomy of 4 cm. at the termination of the superficial femoral were performed.

Pathologically, there was a large periarterial fibrosis in the Hunter canal with parietal enlargement of the superficial femoral artery from the mid-part of the thigh. This enlargement was complete toward the lower portion of the vessel so as to obliterate the vessel totally in its final 4 cm. The popliteal artery and its branches as well as the upper portion of the femorals were normal in appearance. The veins were also normal.

The excised segment of the artery disclosed the following: parietal arteriosclerosis, productive endoarteriopathy and an organized central thrombus.

Although the patient showed marked improvement, he began to have disturbances in the left leg. Operation was performed on the left side June 28, 1949, effecting liberation of the femoral-popliteal arteries as well as arteriectomy of 2 cm. of the termination of the superficial femoral. The lesions seen were the same as those in the right side although less accentuated.

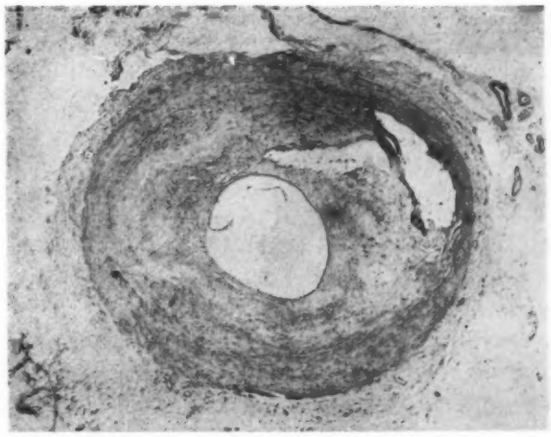


FIG. 6. Typical form, Case II. Transverse section of the femoral artery at the Hunter canal showing proliferation of the subendothelial tissue of the tunica interna. The lumen is reduced but without thrombosis and conservation of the endothelium. There is fibrosis of the tunica media and especially periarterial.

The improvement obtained was progressively bettered. The patient now suffers no discomfort whatever and can walk any distance.

Presenile Form

CASE IV. J. G. M., aged fifty-five, suffered from intermittent claudication in his right leg, with pain and cramps in the calf for three years. He was unable to walk a few meters and had coldness, paleness and cyanosis of the foot. For several months he had had pain while resting. He presented symptoms of bilateral arterial circulatory insufficiency of the legs, much greater in the right where there was also arteritic erythrocyanosis and pronounced trophic disturbances. The tibial, popliteal and dorsalis pedis pulses were not discerned in the right side but the femoral pulses in both sides were good. In the left side the tibial and popliteal pulses were not perceived and the dorsalis pedis pulse was very weak. The oscillometric reading disappeared in the right leg and diminished in the lower third of the right thigh; in the left side the index was very small in the leg, weak in the lower third of the thigh and somewhat decreased in the middle third.

The patient was operated upon November 29, 1948, for bilateral liberation of the femoral-popliteal arteries. Right arteriectomy of the last 3 cm. of the femoral and the first 5 cm. of the popliteal was also performed.

Pathologically, there was extensive bilateral periarterial fibrosis of the Hunter canal. The right superficial femoral artery presented a vast parietal enlargement in the Hunter canal, being almost normal upward. There was also intense parietal fibrosclerosis with productive endoarteriopathy and a partially organized red thrombus. The right popliteal artery also was very much enlarged and had its walls hardened in its upper half; the lower half appeared almost normal. The popliteal artery presented intense parietal fibrosclerosis at its origin with productive endoarteriopathy, calcareous infiltration, an organized central thrombus and total obliteration of its lumen. Toward the bottom the lesions diminished slowly in the same ratio as the lumen of the popliteal artery re-established itself until the popliteal artery became normal below its mid-portion.

In the left side the superficial femoral artery presented parietal enlargement and hardening in the Hunter canal which extended with diminishing progression to the mid-third of the thigh but with partial conservation of the vessel's lumen in its entire extension. The venous trunks were macroscopically normal in both sides.

The patient was relieved from his claudication, being able to walk about 250 meters; pain at rest also disappeared as well as the arteritic erythromelia of his right foot. The left side also improved measurably.

A right lumbar sympathectomy was performed on December 17, 1948, and the patient can now walk 300 meters with claudication.

Case v. C. C., aged sixty-one, suffered from pain at rest and intermittent claudication of the left leg at 100 meters, with pain and cramps in the calf. His disturbances began a year and a half before admission. He also had a healed syphilitic chancre. On examination he was found to have coldness, trophic disturbances, a positive Buerger reaction and absence of the pedis, tibial and popliteal pulses but with the femoral pulse normal. The oscillometric index decreased in the lower third of the left thigh and disappeared completely in the rest of the leg. In the right leg the oscillometric reading was diminished in the lower third of the leg but increased in the lower third of the thigh. The tibial pulse was absent.

The patient was operated upon July 17, 1949, at which time left lumbar sympathectomy, liberation of the femoral-popliteal arteries and superficial femoral arteriectomy of its final 3 cm. were performed.

Pathologically, there was intense periarterial fibrosis in the Hunter canal, with the superficial femoral artery hardened and without pulsations. Its walls showed fibrosclerosis of the tunica media, extensive endoarteriopathy with sclerosis and calcareous impregnation and an organized central thrombus. Above and below this area the walls of the superficial femoral and popliteal arteries also were enlarged and hardened, and changes diminished progressively until the arteries became normalized.

The patient showed marked improvement. Pain at rest disappeared and he was able to return to his professional duties as a dentist. The intermittent claudication reappeared at from 300 to 400 meters of walking.

Case vi. A. B., fifty-three years old, suffered bilateral coldness and intermittent claudication of his right leg, with pain and cramping in the calf on walking 80 to 100 meters. His symptoms began eight years before with only intermittent claudication on physical effort (stair-climbing), becoming progressively worse. On examination he had moderate coldness of both feet, more so in the right where he had discrete arteritic erythromelia. There was a decrease in the angle of circulatory sufficiency in the right side from which the pulses were absent although the femoral pulse was normal. The oscillations were somewhat diminished in the lower third of the right thigh. General examination showed discretely diffused arteriosclerosis.

Lumbar sympathectomy and liberation of the femoral-popliteal arteries were performed October 16, 1950.

Pathologically, there was intense periarterial fibrosis in the Hunter canal. At this level the superficial femoral artery was hard and its walls enlarged, without pulsations but with partial conservation of the vascular lumen. Above the Hunter canal the femoral artery was normal in aspect, as was the popliteal artery. The veins did not present macroscopic changes.

The patient's improvement has been very favorable. He can now walk any desired dis-

tance at a normal pace without claudication. At an accelerated pace the intermittent claudication is reproduced at 100 to 200 meters.

CONCLUSIONS

1. We describe within the arteritis of the legs a new anatomic, clinical entity which we have named stenosed arteriopathy of the Hunter canal and the loop of the adductor magnus.

2. In the disease itself we have described two varieties called typical and presenile.

3. Its clinical and pathologic characteristics have been described.

4. It is fundamentally characterized as being a local disease of the legs, having its origin in the femoral artery at the level of the Hunter canal, especially producing extensive periarterial fibrosis and enlargement of the tunica interna with the conservation of the lumen of the vessel. The veins remain unchanged.

5. The development is chronic and progressive. Arterial thrombosis is produced secondarily as a complication of the process and aggravating it, often suddenly, giving it the appearance of an acute stage.

REFERENCES

1. Palma, E. C. and Domínguez, C. M. Arteriopatía obliterante juvenil y del adulto. Sindrome del anillo del tercer adductor y del canal de Hunter. VII Congreso Internacional de Cirugía. Buenos Aires, 1950.
2. Palma, E. C. Arteriopatías estenosantes del miembro inferior. *Bol. ytrab., Acad. argent. de cir.*, 34: 771–787, 1950.
3. Palma, E. C. Arteriopatías estenosantes y obstructivas del miembro inferior. VII Congreso Inter-Americano de Cirugía. Peru, 1950.
4. Palma, E. C. Arteriopatías obliterantes de los miembros inferiores. *Bol. Soc. de cir. del Uruguay*, 22: 58–78 (1951).
5. Palma, E. C. Contribución al diagnóstico clínico de la obliteración troncular segmentaria en las arteritis de los miembros inferiores. *Arch. urug. de med., cir y especialid.*, 16: 340–346, 1940.
6. Palma, E. C. and Rodríguez Juanotena, J. El tono longitudinal en la fisiopatología arterial periférica. *Bol. Soc. de cir. de Uruguay*, 22: 40–56 1951.

COMBINED OPERATIONS IN THE MANAGEMENT OF CANCER IN THE HEAD AND NECK

JOHN O. VIETA, M.D. AND JOSEPH E. MULÉ, M.D.
New York, New York

A REVIEW of recent literature indicates that there is currently a changing trend in the management of cancer of the head and neck in which surgery rather than radiation therapy is receiving increasing emphasis.[8,16,17,21–23] This has been brought about because of several recognizable factors.

Although the development of physical means of delivering supervoltage therapy is encouraging, such modalities are not readily available and the response to this therapy has not been impressive. Even in cases in which interstitial radium or radon is used to enhance the effect of external therapy, the combination leaves much to be desired in the final therapeutic result as these advances have not increased the percentage of anticipated cures. The more common primary cancers arising in the head and neck are epidermoid in nature. These are, for the most part, only moderately radiosensitive in their primary foci and become more markedly radioresistant when invasion of contiguous structures such as bone or metastases to regional lymph nodes occurs. This also applies to adenocarcinomas primary in these sites.

In the management of metastases to the cervical lymph nodes from primary carcinomas arising in the head and neck area, radiation therapy is known to sterilize a single node or a small group of nodes adequately. However, a canceridal dose of approximately 6,000 r is usually necessary to control a metastatic focus effectively. It is obviously impossible to deliver dosages of this magnitude to the anatomic area of expected metastatic spread, namely, from the level of the mandible to the clavicle. On the other hand radical neck dissection, when properly performed, excises all of the lymph node–bearing areas in the neck where metastases are expected to appear.[14]

Those who prefer radiotherapy to radical neck dissection for the treatment of cervical node metastases overlook the complication resulting from the use of radium and x-ray therapy. These are in the nature of necrosis of the skin and deep structures with cosmetic and functional end results which are often less desirable than those arising from adequate surgery.

A study of the natural history of the more common cancers in the head and neck, as for example cancer of the lip, has revealed that although small, non-infiltrating lesions may be destroyed by radiation, adequate surgery certainly accomplishes the same results in a shorter period of time. Moreover, in those cases of controlled primary lesion the eradication of regional lymph node metastases is in most instances best effected by radical surgical excision.[14] When one is confronted with larger primary lesions in the lip or other areas with lymph node metastases, however, certainly radiation can in no way compete with radical surgery.

In addition by clinical observation and the judicious use of frozen section microscopic analysis at the time of radical surgery, one has a more secure feeling that extirpation of the neoplasm has been completed; while with radiation therapy all information as to peripheral spread is left solely to gross clinical examination of the patient.

Morbidity from surgery is at present comparable to that resulting from radiation therapy. Due to better technics in anesthesia and pre- and postoperative care, improved methods of reconstructive surgery and the use of prostheses radical surgery is, in the opinion of the authors, more acceptable than radiation therapy.

In addition, palliation by extensive surgery is better than palliation by x-ray therapy because it relieves the patient of painful, necrotic lesions and improves his nutrition and general outlook.

There are, however, contraindications to the performance of this type of radical surgery. These procedures are not advocated if the

clinical condition of the patient is poor or if the disease is of such extent that the likelihood of control is not expected. Absolute contraindications to surgery are extensive bilateral metastases adherent to the carotid arteries, distant metastases, anaplastic carcinomas or an uncontrollable primary. However, this type of surgery is indicated wherever it is technically possible to remove all gross evidence of disease without sacrificing the common or internal carotid arteries. Moreover, if one can take the patient from a pitiful state of existence and offer him a fairly comfortable though limited life, palliative surgery of this nature is justified.

The authors recognize that there are many cancers of the upper respiratory and alimentary tract such as those occurring as primary in the tissues of Waldeyer's ring, namely, nasopharynx, soft palate, tonsil, and base of the tongue or paranasal sinuses, which have been best treated to date with combined radiologic and surgical methods.

Consideration of these factors leads to the conclusion that radiation therapy and surgery are complimentary rather than competitive[24] in some instances and that the emphasis to be placed on either is a matter resting with the anatomic and histologic characteristics of any given case.

We do not believe that preoperative radiation therapy as practiced in some clinics is indicated for operable lesions.[23] The concept of cancer therapy is to treat the primary lesion with the best method to effect a cure, hence an operable lesion should be treated with adequate surgery immediately. Preoperative radiation therapy which does not aim toward sterilization of the primary neoplasm leads to delay in surgery, complicates the operative procedure, inhibits wound healing and allows extension of the primary tumor to contiguous structures. All these factors alter the prognosis disfavorably.[17]

Radical surgical treatment of cancer is understood by the majority to include the excision of the primary lesion and the node-bearing areas and necessitates combined one-stage procedures when possible. As Gilchrist[5] has recently stated it necessitates removal of the tumor, its surrounding soft parts, all the lymph nodes which drain the area and, if possible, the first alternate group of nodes. There is no doubt in most surgeons' minds that operations such as hemicolectomy, total gastrectomy and radical mastectomy are acceptable modalities of treatment in cancer of these organs. These procedures are examples of excision and dissection in continuity. In the surgical management of certain cancers occurring in the head and neck this same principle can be applied.

Sugarbaker[17] has tabulated the incidence of lymph node metastases from certain cancers in the head and neck as follows: cancer of intrinsic larynx, 10 per cent; cancer of lip, 31 per cent; cancer of lower gingiva, 35 per cent; cancer of buccal mucosa, 40 per cent; cancer of tongue and floor of mouth 63 per cent; cancer of extrinsic larynx, 70 per cent. These figures approach those of Martin[9–13] for the same lesions when over-all incidence of metastatic node involvement is considered. All of the foregoing tumors lend themselves to radical surgical treatment in many instances.

In the clinical evaluation of the presence of secondary cancer in the regional lymph nodes Kennedy[7] has estimated the percentage of error as 14 per cent, Judd and Beahrs[6] as high as 24 per cent. In any group of patients without palpable cervical nodes, who are submitted to operation, the incidence of microscopic involvement is fairly constant, irrespective of the size of the primary lesion. Some observers[2] who believe in close observation and follow-up for the discovery of metastases in the regional lymph nodes report a fairly high incidence of distant metastatic disease from cancer primary in the head and neck.

As far as controllability is concerned, the most favorable "cancer" of the head and neck is cancer of the lip. Most opinions for or against neck dissection have been based upon the clinical behavior of cancer of the lip. Other cancers arising in the head and neck are more lethal than carcinomas arising in the lip and regularly metastasize more frequently. Thus considering that the percentage of clinical error in estimating the presence of metastatic disease is variously quoted as being at least 10 per cent[19,20] when a tumor regu'arly metastasizes to a group of lymph nodes readily removable by surgery, so-called "prophylactic neck dissection" is in many instances more likely to be a "therapeutic dissection." The term, prophylactic neck dissection, used herein does not allude to a separate and independent procedure[14] as understood by some but rather

to a dissection in conjunction with excision of the primary lesion in continuity. Some authors suggest waiting for an indefinite period of time before radical dissection is performed to await the filtering of embolic metastases by the regional nodes.[15] The authors adhere to this sound surgical principle when the anatomic location of the primary tumor makes it impossible to do an excision and dissection in continuity, for example, carcinoma of the soft palate or maxillary sinus, hard palate or gingiva of the maxilla. (Table 1.)

TABLE 1

Total number of cases of cancer in the head and neck reviewed for operative treatment	91
Number of such cases considered inoperable	26
Number of cases considered operable	65
(A) Number of cases treated with staged procedure (radiotherapy plus surgery or surgery in stages)	37
(B) Number of patients who refused treatment	3
(C) Number of cases treated with one-stage combined operation	25

With the present, continuing lag in the early treatment of cancer the procedures to be discussed will of necessity, we believe, have to be carried out if a better prognosis is to be offered. The curability of node metastases is vastly lessened if the neck dissection is deferred until the involvement is clinically certain. Blair and Byars[1] have described cases of cancer of the tongue in which doubtful nodes have become inoperable between two observation visits covering five weeks.

In one series of cases no patient with epidermoid carcinoma had visceral metastases who did not have cervical lymph node involvement at some time during the clinical course of the disease.[2] It would seem logical to conclude that the incidence of distant secondaries would be less if the regional nodes had been removed by surgery.

It has been proved that the disease is far advanced when the clinical diagnosis of metastatic involvement is readily apparent. Some clinicians are so pessimistic in their prognosis that they compare the presence of deep cervical node metastases from cancer of the head and neck to the poor prognosis of supraclavicular node metastases in cancer of the breast. The authors believe that if such a gloomy attitude is justified, there would be few indications for radical neck dissection. A more equitable comparison would be a situation simulating axillary node metastases in cancer of the breast.

In proven operable cancer of the breast the operation of choice is radical mastectomy which is a prophylactic dissection of lymph nodes in continuity; few will criticize the therapeutic effect of such a procedure. Statistically the treatment of carcinoma of the breast by radical mastectomy in which axillary nodes are histologically negative offers a prognosis at least twice that compiled for histologically positive axillary nodes. Therefore, in the surgical management of primary cancer arising in the head and neck, when the principle of excision and dissection in continuity is possible, a regional neck dissection should be mandatory in conjunction with excision of the primary lesion. Although an attack of the expected metastatic bed may appear to be prophylactic in clinically negative cases, it will frequently be therapeutic because of the presence of histologically positive nodes on microscopic examination.

It must be conceded that the procedures to be discussed were carried out for the management of advanced disease and the indications for this type of treatment on that basis were precisely defined.

From the foregoing considerations the following principles of treatment of the most common types of carcinoma of the head and neck have been evolved and are illustrated by case reports.*

CARCINOMA OF THE LIP

The treatment of choice for cancer of the lip is surgery. Small lesions measuring up to 1 cm. in diameter in which minimal infiltration of the musculature is demonstrable can be treated either with radiation therapy or by V excision. Any larger lesion which obviously involves the orbicularis oris muscle or has recurred following non-surgical means of therapy and which is associated with a marked inflammatory reaction should be eradicated by a V excision, the Abbe-Estlander or Bernard type of cheiloplasty. Lesions occurring at the commissures are usually more malignant and more difficult to control. Therefore, the surgical attack must be more radical in extent than for those cancers occurring near the midline of the lip.

* Acknowledgment is made to the surgical services of various hospitals mentioned in text for inclusion of case reports.

The likelihood of metastases to the cervical nodes is higher when there is any degree of infiltration of the musculature or if the histologic analysis shows areas of undifferentiated carcinoma. In such cases we believe that in the absence of clinically demonstrable node enlargement a bilateral supraomohyoid neck dissection should be performed after the primary lesion has been eradicated by surgery. If aspiration biopsy denotes metastatic deposits in the jugular lymph node chain, a complete radical neck dissection on the side of the lesion plus a supraomohyoid neck dissection on the opposite side should be the operation of choice. We prefer the excision of the primary lesion and the dissections of the neck at the same operation. If the nodes of the supraomohyoid dissection are also positive for metastatic disease, the complete radical neck dissection of that side should be done in one month to six weeks' time. With the surgical management of carcinoma of the lip radiation therapy to the neck nodes is never indicated. Wherever there is an infiltration of bone (mandible), the contiguous osseous structure should be excised in continuity. When total ablation of the lower lip is indicated, the defect can be repaired by the bilateral Bernard cheiloplasty. This procedure is combined with a complete neck dissection on one side and supraomohyoid neck dissection on the opposite side to be followed with a completion of the radical dissection in one month's time. Postoperatively, in those cases with excision of the second internal jugular vein, the patient is kept in a sitting position in an oxygen tent and the dressing on the operative wound is maintained with minimal compression of the neck. When laryngeal edema is suspected, tracheostomy is mandatory. In fact the authors practice the routine use of temporary tracheostomy in every patient who has had a bilateral neck dissection.

Case 1. P. B., a seventy-one year old white male, was admitted to the Danbury Hospital, Danbury, Connecticut, on September 17, 1947. He had a history of a slowly progressing ulcerated lesion of the lower lip present for two years. Examination revealed a 4.5 cm. fungating ulcerated lesion of the lower lip extending from a point 2 cm. from the right commissure to 0.5 cm. of left commissure of the mouth. Metastatic nodes up to 3 cm. in diameter were palpable in both submental triangles and no clinically palpable nodes were noted in the deep cervical chain.

On September 27, 1947, a bilateral supraomohyoid neck dissection and excision of lower lip were carried out. A large Estlander pedicle flap taken from left cheek was swung into the defect of the lower lip to secure a primary closure. The resulting stomal orifice was small but would readily admit two fingers. The patient withstood the procedure well and all wounds healed by primary union. The patient left the hospital in ten days. The arterial pedicle of the Estlander flap was divided in six weeks. Pathologic diagnosis was epidermoid carcinoma grade II with metastases to multiple submental and submaxillary lymph nodes.

On January 13, 1948, a small nodule appeared adjacent to the suture line in the lip on the right side. Biopsy revealed recurrent epidermoid carcinoma. On January 27th excision of the local recurrence in the lip was carried out. In attempting to reconstruct the lip by a unilateral Bernard cheiloplasty it was noted on mobilization of the right cheek that there was gross evidence of disease below the gingivo-buccal gutter opposite the level of the first bicuspid tooth. The aforementioned procedure was abandoned and the lower lip reconstructed by use of an Estlander flap from the right side to close the resultant defect.

As the disease process in the right gingivobuccal gutter still appeared to be localized and resectable, a right radical neck dissection and excision of the right half of mandible and adjacent area of skin of the right cheek and a tracheostomy were done in one stage without incident on February 27th. The defect of the cheek and floor of the mouth were closed by suturing the edge of tongue to the mucous membrane of the upper gingiva-buccal gutter and the resulting skin defect was covered with a split thickness skin graft. The wounds healed and a 90 per cent "take" of the skin graft resulted. The tracheostomy tube was removed on the tenth postoperative day. Pathologic diagnosis was recurrent epidermoid carcinoma of the skin of the cheek and buccal mucosa. The patient was discharged on March 17, 1948.

On May 14, 1948, a node appeared in the left mid-jugular chain which on aspiration biopsy was reported to be metastatic epidermoid carcinoma. On June 26th, a left radical

neck dissection was performed (with extirpation of the remaining second internal jugular vein) with tracheostomy. The patient made an uneventful recovery except for some residual edema of the face.

The patient was followed up at monthly intervals and remained free of pain without evidence of disease until March 25, 1949, when a recurrence was noted in the skin over the chin. Within two weeks the lesion grew to 8 cm. in diameter and was associated with severe pain. The patient expired on May 19, 1949.

Comment. In accordance with the principle of excision and dissection in continuity the clinical course of this patient may have been altered. If total ablation of the lower lip had been performed with bilateral supraomohyoid neck dissection in continuity and the resultant defect closed by a bilateral Bernard cheiloplasty, there would have been less likelihood of recurrence of disease in the skin over the chin. The subsequent appearance of jugular chain metastases in a clinically negative neck indicates that a bilateral radical neck dissection would have been more prudent.

CARCINOMA OF GINGIVA AND FLOOR OF MOUTH

In view of the sequelae of adequate radiologic therapy for cancer of the lower gingiva and floor of the mouth (radionecrosis, osteomyelitis, sequestration and prolonged morbidity) surgical therapy is indicated. For superficial non-infiltrating lesions with no evidence of cervical node metastases adequate excision of the lesion and contiguous alveolar ridge of the mandible and inner table of this bone should be sufficient. The necessity for resection of the mandible stems from the fact that in many patients the lymphatics from the floor of the mouth enroute to the submaxillary nodes traverse the periosteum of the mandible.[23] This excision is always combined with at least a supraomohyoid neck dissection on the ipsolateral side. Should frozen section of suspicious nodes reveal metastatic disease, a complete neck dissection is performed. Whenever there is radiographic or clinical suspicion of periosteal or osseous infiltration, a larger segment of bone is removed. It is wiser to be on the side of radicalism in the excision of diseased bone than to hazard the risk of leaving residual cancer. When indicated hemiresection of the mandible carried out with a complete neck dissection[14, 16, 18] in continuity and tracheostomy in one stage, as developed by Martin and associates, is the procedure of choice. Whenever there is interruption of continuity of the mandibular arch, tracheostomy is of vital importance. Monthly observation of the patient for at least two years will reveal the necessity for contralateral neck dissection.

CASE II. H. C., a forty-three year old white female, was admitted on October 18, 1947, to the Flower and Fifth Avenue Hospitals with a complaint of ulceration of the right side of the floor of the mouth of at least four months' duration. On examination an ulcerated lesion measuring 2 by 0.5 by 3 cm. was seen which was adjacent to the second lower molar tooth and lying over the proximal extension of the submaxillary duct. The lesion involved the gingiva but did not appear to infiltrate the mandible. There were no palpable nodes in the neck. Biopsy was reported as epidermoid carcinoma; radiographs of the mandible revealed no evidence of bone involvement.

On October 20, 1947, resection of a 5 cm. segment of the right mandible and right half of the floor of the mouth and a 1 cm. strip of the border of the tongue and radical neck dissection in continuity with tracheostomy was performed. The wounds healed by primary union and the tracheostomy tube was removed in ten days. The patient was discharged on the fourteenth postoperative day.

Pathologic diagnosis was infiltrating epidermoid carcinoma of the oral mucosa with invasion of the capsule of the right submaxillary gland. No invasion of bone or muscles or metastases to lymph nodes was noted.

This represents excision and dissection in continuity with extirpation of the primary disease and its expected metastatic manifestations. In the past this lesion would have been treated with x-ray therapy and interstitial radon seed implantation.

The patient has been followed up at regular intervals and remains free of disease to date. The cosmetic and functional result is excellent. (Fig. 1.)

CARCINOMA OF THE TONGUE

Most cancers of the base of the tongue are best treated with radiation. Those cases of lingual cancer which are selected for surgical therapy are the ulcerating, infiltrating type

FIG. 1. Case II. Three years following a combined radical neck dissection and jaw resection for carcinoma of gingiva and floor of the mouth.

of lesion located in the anterior two-thirds of the tongue. Leukoplakia associated with leutic glossitis which frequently develops into carcinoma is notoriously radioresistant and is solely a surgical problem. The exophytic or rapidly growing anaplastic lesions are in most instances treated with radiation therapy.

In cancer of the tongue there is no place for watchful waiting regarding the indication for radical neck dissection. This should be done in combination with extirpation of the primary lesion and the floor of the mouth. The latter measure is necessitated because of the high rate of recurrence of lingual cancer in the floor of the mouth. Furthermore, the authors believe that all patients with surgically treated cancer of the tongue or those treated with radiologic methods with controlled primary lesions should ideally have a bilateral complete radical neck dissection in two stages. This is motivated by the high incidence of bilateral cervical node metastases. Whenever necessary to circumscribe periosteal or bone infiltration adequately, combined resection of the mandible and floor of the mouth in continuity should be performed in one stage with the radical neck dissection and tracheostomy. What has been said for the foregoing applies in the treatment of cancer arising in the buccal mucosa.

CASE III. B. M., a sixty-six year old male was admitted to Metropolitan Hospital on September 9, 1948. Past history revealed that on February 11, 1947, he had been admitted for pneumonia of the right lung. Patient's complaints for three months prior to admission were the gradual development of a painful ulcerated lesion on the left lateral border of the tongue associated with dysphagia and bloody expectoration.

FIG. 2. Case III. Surgical specimen. Specimen includes more than half the tongue, floor of the mouth, half the mandible and contents of radical neck dissection in continuity.

Local examination revealed a deep ulcer crater 3 by 1.5 cm. involving the lateral border of the tongue and extending into the floor of the mouth on the left. The neoplastic process measured 4 by 3 cm. and the growth was only slightly movable due to fixation to the mandible and the floor of the mouth. There was a palpably enlarged node 2 cm. in diameter at the level of the left carotid bifurcation. Radiographs of the mandible were negative for bone destruction; a chest film revealed chronic tuberculosis.

Biopsy on September 10, 1948, was reported as squamous carcinoma. On September 30th a combined left radical neck dissection, hemimandibulectomy, hemiglossectomy with excision of the floor of mouth and tracheostomy were done under general anesthesia. (Fig. 2.) The postoperative course was uncomplicated. Pathologic diagnosis was squamous carcinoma of tongue and floor of mouth with neck nodes negative for metastases.

On July 2, 1949, the patient was readmitted for weight loss, cough, hemoptysis and chest pain. Radiographs of the chest revealed advanced pulmonary tuberculosis, active, with a question of metastases to the left lower

lung field. On July 24th a mass was noted in the right inguinal area. Aspiration biopsy was reported to show metastatic epidermoid carcinoma. Radiographs of the skeleton were negative for metastases. No other primary source of cancer was found to explain the metastatic disease in the groin. The patient's course was progressively downhill and death occurred on August 2, 1949; no autopsy was obtained. The patient at no time exhibited any evidence of recurrent disease in the head and neck area.

CASE IV. J. G., a sixty-five year old white male, was admitted to the Lenox Hill Hospital on December 23, 1948, with the chief complaint of a large ulcerating lesion of the mucosa of the left cheek accompanied by a toothache and swelling of the left side of the face. Examination revealed an indurated and ulcerated area 4 cm. in diameter involving the mucosa of the left cheek and extending on to the mucosa covering the ascending ramus of the mandible. In the left submaxillary triangle there was a firm, movable node measuring 3 cm. in diameter.

Radiographs of the chest revealed dilatation and tortuosity of the ascending aorta consistent with aneurysm. The mandible was negative for bone disorder.

On December 24th a biopsy of the ulceration was reported as epidermoid carcinoma. Radiologic therapy was considered; however, the radiotherapist thought that surgery offered a greater chance for ultimate control.

On December 31st a combined radical neck dissection, hemimandibulectomy with excision of a portion of the tongue, floor of the mouth and wide excision of the primary tumor and a segment of the alveolar process of the maxilla in continuity followed with tracheostomy were carried out. The oral cavity was epithelialized by suturing the lateral border of the tongue to the mucous membrane of the hard palate and remaining mucosa of the cheek and lip. The left parotid duct was implanted into the mouth.

Pathologic diagnosis was carcinoma of mucosa of cheek and gingiva with metastases to multiple lymph nodes in the submaxillary triangle.

The postoperative convalescence was uneventful except for slow healing of the lower skin flaps in the neck. The tracheostomy tube was removed on the eleventh postoperative day. The patient was discharged from the hospital on January 27, 1949, and has remained free of recurrent disease to date.

CARCINOMA OF THE SALIVARY GLANDS

The majority of carcinomas arising in the major or minor salivary glands are mucoepidermoid or adenocarcinomas and are notoriously radioresistant. The treatment of choice is an ipsolateral radical neck dissection and total excision of the involved major gland. In dealing with the parotid gland, whenever necessary, the facial nerve is sacrificed. If there is involvement of the mandible or portions of the skull, the affected bone is widely excised.

CASE V. A. D., a seventy-eight year old white female, was admitted to St. John's Episcopal Hospital, Brooklyn, on June 4, 1948, with the complaint of dysphagia, dysphonia and dyspnea. These symptoms had become progressively more severe over a period of five years with rapid progression of symptoms one month before admission. The patient stated that nine or ten years previously she had received eight x-ray treatments for a tumor of the tongue. No biopsy report of that lesion was available.

Examination revealed an elderly, white female in poor general condition with evidence of marked emaciation. The remainder of the physical examination revealed generalized arteriosclerosis and a circumscribed mass in the lower medial quadrant of the left breast. Aspiration biopsy of the breast mass revealed an infiltrating duct carcinoma. A biopsy of the pharyngeal mass was reported low grade adenocarcinoma of minor salivary gland origin.

The hypopharynx revealed a sessile fungating mass measuring 8 by 5 cm. in diameter attached to the base of the tongue extending downward to the vallecula and laterally to the pharyngeal wall. It was impossible to visualize the epiglottis or larynx due to the bulkiness of the mass which almost completely occluded the oropharynx. Dyspnea increased and on June 7th a low tracheostomy was performed under local anesthesia. A nasopharyngeal catheter was passed for feeding purposes.

On June 23rd under pentothal® anesthesia with oxygen administered through tracheostomy tube, the following operative procedure was performed: a right supraomohyoid neck dissection, suprahyoid and lateral pharyn-

gotomy with ligations of the right and left external carotid arteries, and resection of the tumor. This exposure permitted excellent visualization of the hypopharyngeal mass. A wide excision of the tumor with normal tissue margins of muscle at the base of the tongue was effected. Ten gold radon seeds, each of 1 mc. strength, were implanted into the operative defect of the tongue. The patient withstood the operative procedure without incident. On the eighth postoperative day a pharyngeal-cutaneous fistula was noted. The fistula persisted until August 9th when it was closed by freeing up and approximating the edges of the mucous membrane and advancing a skin flap from the neck to the suprahyoid area. On August 20th the tracheostomy tube was removed and the stoma closed spontaneously.

Pathologic diagnosis was low-grade adenocarcinoma of salivary gland origin. The patient remains free of recurrent disease in the tongue and refuses surgery for carcinoma of the breast.

CANCER OF THE THYROID GLAND

Given an isolated nodule in either lobe of the thyroid gland which is proven to be carcinoma on aspiration biopsy or frozen section, our treatment is hemithyroidectomy, excision of the isthmus and ipsolateral radical neck dissection omitting dissection of the submaxillary triangle. If there are cervical node metastases, a complete radical neck dissection is performed. In those cases with suspicious extension of disease beyond the midline total thyroidectomy and neck dissection with preservation of both recurrent laryngeal nerves, unless invaded by tumor, is indicated. It is usually possible to preserve some parathyroid tissue and one of the recurrent laryngeal nerves. With extensive dissections about the trachea routine tracheostomy is done. In the performance of radical surgery for thyroid cancer the strap muscles are sacrificed. Likewise, excision of portions of contiguous areas of trachea and esophagus is added if indicated by the surgical findings. Total thyroidectomy is indicated in those cases with distant metastases whose treatment is amenable to radioactive isotopes.

There is no doubt that postoperative radiologic therapy is indicated whenever total extirpation of the disease has not been accomplished by surgery. Radiation therapy is of definite value in the palliative management of thyroid cancer.[22]

Case VI. B. B., a forty year old white male, was admitted to the Flower and Fifth Avenue Hospitals on July 4, 1947, with pain in the left chest wall beneath an old operative scar, the result of an operation for cysts of the left sixth and seventh ribs. Past history revealed excision of the left testicle for a seminoma in 1943.

On physical examination a nodular mass in the region of the right lobe of the thyroid gland was found which extended across the midline of the isthmus. The mass appeared to be firmly adherent to the thyroid cartilage and trachea. There was an enlarged metastatic node about 3 cm. in diameter in the right midjugular chain. The patient also exhibited findings consistent with the diagnosis of von Recklinghausen's neurofibromatosis associated with marked deformity of the spine and aplasia of the maxillae.

In view of the previous history of excision of a malignant testicular tumor and the findings of neurofibromatosis, a biopsy of the mass in the region of the right lobe of the thyroid gland was performed on July 16, 1947. At operation it was noted that there was a tumor arising from the thyroid gland infiltrating the pretracheal muscles. Pathologic diagnosis was adenocarcinoma of the thyroid. Esophagoscopy and bronchoscopy were negative; radiographs of the chest and skeletal system revealed no metastatic foci.

On July 24, 1947, a tracer dose of 1.09 μc. I^{131} was given. On July 26th under general anesthesia a total thyroidectomy, right radical neck dissection (the submaxillary triangle was not dissected) and left lower neck dissection with the preservation of the left jugular vein were done. The excision included a small portion of the wall of the esophagus on the right side. The right recurrent laryngeal nerve and pretracheal strap muscles from origin to insertion were removed. A tracheostomy was added at the completion of the operation. The patient withstood the procedure well.

The postoperative convalescence was marked by the following complications: on July 30th carpopedial spasm developed. The blood calcium was 7.2 mg. per cent. The patient was given intravenous calcium gluconate and paratharmone; the tetany was subsequently controlled with dihydrotachysterol. On the

sixth postoperative day a mucopurulent discharge from the drainage wound in the right lateral neck was noted and an esophageal fistula suspected. On August 4th it was definitely established that the fistula arose in the region of the right pyriform sinus.

On August 10th the pharyngeal fistula had closed; the tracheal stoma remained open due to retraction of surrounding scar tissue. The stoma was closed with a sliding skin flap from the sternal area on September 12th.

Pathologic diagnosis was papillary adenocarcinoma grade II of thyroid gland with metastases to numerous lymph nodes in the left and right supraclavicular and right midcervical areas. Radioautographs of sections of the thyroid carcinoma revealed no pick-up of isotope by the tumor. The patient has remained free of recurrent carcinoma to date of writing.

CANCER OF THE LARYNX

In the treatment of laryngeal cancer a high degree of selectivity is necessary in choosing modalities of therapy. For extensive cancer of either the intrinsic or extrinsic larynx better palliation and occasional chance of cure may be obtained by surgery.

In early lesions of the intrinsic larynx there is little to choose between radiation therapy and surgery; both offer excellent results. However, with more extensive involvement or when the disease has recurred following radiation therapy, total laryngectomy is indicated. In view of the low incidence of metastases (10 per cent, Sugarbaker) from carcinoma arising in the vocal cords routine neck dissection is not done with total laryngectomy. However, if total laryngectomy is indicated and there are metastatic nodes as proven by aspiration biopsy, radical neck dissection is carried out as a one-stage operation with the laryngectomy.

In those cases with bilateral node metastases and spill over into the pharynx a total laryngectomy and bilateral neck dissection with preservation of one internal jugular vein in one stage, as described by Brunschwig,[3] appears to offer the greatest comfort to the patient. This procedure usually will eradicate all gross evidence of disease. Whenever the excision necessitates the creation of a pharyngostome, the patient is tube-fed and a plastic closure is effected as soon as possible. Surgery of this nature is regarded as palliative, namely, necessary to permit vital function since the majority of these patients would sooner or later die of hemorrhage, asphyxia or inanition before death from distant metastases occurs.

The end results in carcinoma of the extrinsic larynx, pyriform sinus, or hypopharynx treated solely with radiation therapy have left much to be desired. Here, particularly, radiologic methods cannot control the metastases; therefore, the authors advocate a one-stage total laryngectomy and radical neck dissection for carcinoma of the extrinsic larynx regardless of the absence of clinically involved neck nodes. In view of the high incidence of bilateral node metastases in cancer of the extrinsic larynx (70 per cent Sugarbaker) the opposite side of the neck should be dissected at a later date.

CASE VII. J. K., a sixty-three year old white male, was admitted to the tumor clinic of the Danbury Hospital on September 10, 1948, with a history of increasing hoarseness for a period of twelve months. In the month prior to admission there had been progressively increasing dyspnea.

At the first examination on September 10, 1948, the patient exhibited marked laryngeal stridor and was in need of immediate tracheostomy. There were two enlarged metastatic nodes at the level of the thyroid cartilage on the left side of the neck. No extension was noted into either pyriform sinuses. Total laryngectomy and left radical neck dissection were considered to be the procedure of choice. Laryngoscopy, performed two days after tracheostomy, revealed a large ulcerating lesion filling the rima glottis and involving both ventricular bands and the base of the epiglottis. The patient refused any therapy at this time. Re-examination one month later revealed in addition to the foregoing a metastatic node measuring 3 cm. in diameter in the right mid-jugular chain. The patient agreed to undergo the operative procedure herein outlined. On October 14, 1948, a one-stage bilateral radical neck dissection with preservation of the right jugular vein and total laryngectomy including the pretracheal muscles was done under pentothal anesthesia. The patient withstood the procedure well. Pathologic diagnosis was epidermoid carcinoma grade II with metastases to regional lymph nodes bilaterally.

The wounds healed by primary union and the patient was discharged from the hospital on the twelfth postoperative day. The patient remained free of local recurrence and was comfortable until October 10, 1949, when he began to experience pain in the right ear. Examination at this time revealed a submucosal mass measuring 2 cm. in diameter at the base of the tongue on the right and a nodule 2 cm. in diameter over the right mastoid process. Aspiration biopsy revealed epidermoid carcinoma in both areas. On November 8, 1949, fifteen gold radon seeds, each of 1 mc., were inserted into the lesion at base of tongue and ten seeds of 1 mc. were inserted into the mass over the right mastoid area. In addition the patient received 4,000 r of x-ray therapy through 5 cm. cones to each of two portals covering the previously-mentioned lesions. Examination on December 4, 1949, revealed marked regression in the treated areas and the patient was free of pain.

On January 10, 1950, the patient was hospitalized because of chills and fever and signs of massive pneumonitis of the right lung. Radiographs were interpreted as showing massive lobar pneumonia. The patient was treated with penicillin and aureomycin but died in two days.

Comment. It is possible this patient may have had metastatic disease in the lungs, but there was no clinical indications of such a finding one month prior to the terminal illness. Previous radiographs of the chest were reported negative for metastases.

This case represents one showing retrograde spread of metastases, and the authors believe that palliation in this instance justified the surgical intervention and doubt that the same result could have been obtained with radiation therapy as the sole method of management.

Case VIII. W. C., a fifty-eight year old white male, entered the Flower and Fifth Avenue Hospitals on November 12, 1949, with the history of having had a sore throat beginning in July, 1949. Six weeks prior to admission the patient had noted hoarseness, dysphagia and expectoration of blood. There had been a fifteen-pound weight loss.

Examination on November 7th revealed a fungating ulcerated neoplasm involving the arytenoid area and extending to the lateral and posterior wall of the larynx down to the right pyriform sinus. The right vocal cord was paralyzed and infiltrated by tumor tissue. There were no palpable nodes in the neck.

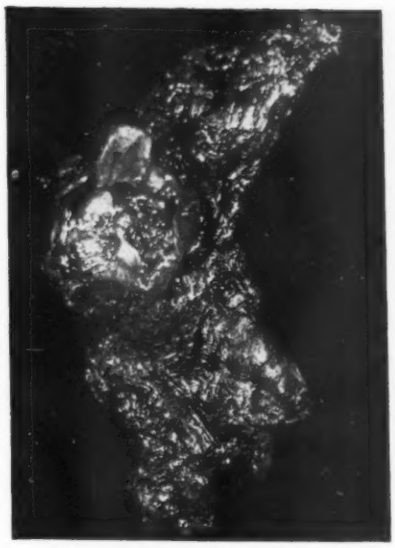


Fig. 3. Case VIII. Surgical specimen. Large carcinoma of extrinsic larynx removed in continuity with right radical neck dissection.

On November 14th a right radical neck dissection and total laryngectomy and excision of the pretracheal muscles in continuity was performed under general anesthesia. (Fig. 3.)

The pharynx was reconstructed over a 14 F. rubber catheter. The postoperative coarse was uneventful until the twelfth postoperative day when it was noted that some saliva was escaping through the drainage wound of the neck dissection. A pharyngeal fistula was apparent; this had completely closed on the twenty-eighth postoperative day.

Pathologic diagnosis was infiltrating squamous carcinoma of the extrinsic larynx showing extensive infiltration of the posterior laryngeal wall and lymphatics. There were no lymph node metastases. The patient has remained free of evidence of recurrent disease to present date.

MALIGNANT TUMORS OF SKIN OF HEAD AND NECK

Basal cell epithelioma and squamous cell carcinoma of the skin of the head and neck may be treated either with surgery or radiation therapy. However, we would suggest a word of caution for the use of radiation therapy over bony processes or cartilage. These areas are prone to undergo radionecrosis of the

FIG. 4A. Case IX. Clinical, preoperative photograph showing squamous cell carcinoma of skin of face as a complication of radiodermatitis.

supporting connective tissues and hence in many instances either will be insufficiently treated or will be attended by ulceration and necrosis. Furthermore, all recurrent squamous cell carcinoma should be treated with radical surgery and regional lymph node dissection in continuity when feasible.

Malignant melanomas of the skin are best treated with wide surgical excision and radical dissection of lymph node areas in continuity. The extent of the anatomic lymph node dissection will depend on the location of the primary lesion, for example, a lesion occurring in the preauricular area would demand excision of the preauricular nodes, parotid gland and radical neck dissection since this procedure would encompass the usual foci of metastatic spread of a primary neoplasm in this region.

CASE IX. R. F., a sixty-six year old white female, was admitted to the Metropolitan Hospital on April 11, 1949. In 1915 the patient had received some x-ray therapy for facial hirsutism. She suffered severe x-ray dermatitis with this therapy and since that time there had been scabbing, bleeding and painful ulceration of the skin of the face. (Fig. 4.) Six weeks prior to admission there was marked progressive enlargement of the areas of ulceration associated with pain and hemorrhage. Physical examination revealed hypertensive cardiovascular disease and the presence of diffusely ulcerated skin lesions involving the chin and cheeks. Multiple biopsies from the ulcerated lesions showed epidermoid carcinoma. There were enlarged nodes in both submaxillary triangles. On April 21, 1949,

FIG. 4B. Same case; first postoperative dressing on the fifth day showing pedicle flap from left breast in place after resection of primary tumor and bilateral supraomohyoid neck dissection in continuity.

a bilateral supraomohyoid neck dissection and excision of skin and muscle of cheeks and chin down to the subjacent mucous membrane were carried out in continuity. The resulting skin defect was closed primarily by forming a full thickness pedicle flap from the large, pendulous left breast and advancing it into the defect of the face and neck. Primary wound healing occurred except for an area measuring 3 cm. in diameter over the left mandible. This was repaired by a split thickness skin graft.

Pathologic diagnosis was squamous cell carcinoma of skin of face with metastases to the left submaxillary lymph nodes.

The patient was discharged on June 23, 1949. Despite the loss of the musculature of the lower lip and eversion of the mucous membrane due to some scar contracture about the chin, the patient is able to take all her food by mouth and there is minimal drooling. There

has been no evidence of recurrence of carcinoma to date.

SUMMARY

With the present continued lag in the early diagnosis of cancer of the head and neck, therapy should assume a more aggressive attitude if a greater number of patients are to be salvaged. The concept of excision and dissection in continuity is not new. However, it should be performed earlier and more frequently. The plea is not for more extensive surgery; it is rather for adequate surgery. Such well conceived operations should be planned and performed by surgeons treating extensive cancer. The use of good surgical judgment and modern concepts of pre- and postoperative care offers patients with advanced cancer of the head and neck more than radiation therapy.

The cases presented are examples of this plan of treatment whether for definitive cure or for palliation of advanced cancer. Their management likewise showed that the certainty of establishing the presence of cryptic regional lymph node metastases may be proven by performing a dissection in continuity, when possible, in one stage with excision of the primary growth.

Although non-surgical methods of palliation in the treatment of cancer may be developed, surgery offers an excellent means to give relief of pain, remove foul necrotic ulcerations and establish airways and oral feedings for those stricken with overwhelming localized cancer in the head and neck.

REFERENCES

1. Blair, V. P. and Byars, L. T. Current treatment of cancer of the lip: a clinical speculation. *Surgery*, 27: 340, 1940.
2. Braund, R. D. and Martin, H. E. Distant metastases in cancer of the upper respiratory and alimentary tracts. *Surg., Gynec. & Obst.*, 73: 63, 1941.
3. Brunschwig, A. Further experience with pan-laryngectomy for advanced carcinoma of the larynx. *Surg., Gynec. & Obst.*, 83: 639, 1946.
4. Conway, H. Reconstructive surgery following radical operations for malignant tumors of the head and neck. *Ann. Surg.*, 131: 64, 1950.
5. Gilchrist, R. K. Surgical management of advanced cancer of the breast. *Arch. Surg.*, 61: 913, 1950.
6. Judd, E. S., Jr. and Beahrs, O. H. Epithelioma of the lower lip. Evaluation of dissection of cervical lymph nodes. *Arch. Surg.*, 59: 422, 1949.
7. Kennedy, R. H. Management of lymph nodes in the neck—metastatic from carcinoma of the mouth. *Ann. Surg.*, 114: 813, 1941.
8. MacDonald, J. Combined radical cervico-facial procedures for primary facial cancer. *Surg., Gynec. & Obst.*, 90: 16, 1950.
9. Martin, H. E., Munster, H. and Sugarbaker, E. C. Cancer of the tongue. *Arch. Surg.*, 41: 1–49, 1940.
10. Martin, H. E. and Blady, J. V. Cancer of nasopharynx. *Arch. Otolaryng.*, 32: 692–727, 1940.
11. Martin, H. E. and Sugarbaker, E. C. Cancer of the tonsil. *Am. J. Surg.*, 52: 155–196, 1941.
12. Martin, H. E. and Sugarbaker, E. C. Cancer of the floor of the mouth. *Surg., Gynec. & Obst.*, 71: 347–59, 1940.
13. Martin, H. E., MacComb, W. S. and Blady, J. V. Cancer of the lip. *Ann. Surg.*, 114: 226–242, 341–368, 1941.
14. Martin, H. et al. Neck Dissection. *Cancer*, 4: 441, 1951.
15. Slaughter, D. P. Neck dissections, indications and technics. *Surg. Clin. North America*, 26: 102, 1946.
16. Slaughter, D. P. and Roeser, E. H. Recent advances in the surgical treatment of intraoral cancer. *Surg. Clin. North America*, 1317, 1949.
17. Sugarbaker, E. C. The surgical problem of cancer in lymph nodes. *Surgery*, 18: 608, 1945.
18. Sugarbaker, E. C. and Gilford, J. Combined jaw resection neck dissection for metastatic carcinoma of cervical lymph nodes secondarily involving the mandible. *Surg., Gynec. & Obst.*, 83: 767, 1946.
19. Taylor, G. W. and Nathanson, I. Evaluation of neck dissection in carcinoma of the lip. *Surg., Gynec. & Obst.*, 69: 484, 1939.
20. Taylor, G. and Nathanson, I. Lymph Node Metastases. New York, 1942. Oxford University Press.
21. Ward, G. E. and Hendrick, J. W. Results of treatment of carcinoma of the lip. *Surgery*, 27: 321, 1950.
22. Ward, G. E., Hendrick, J. W. and Chambers, R. G. Carcinoma of the thyroid gland. *Ann. Surg.*, 131: 473, 1950.
23. Ward, G. E. and Hendrick, J. W. Diagnosis and Treatment of Tumors of the Head and Neck. Baltimore, 1950. Williams & Wilkins, Co.
24. Wilson, H. Results of the treatment of metastatic carcinoma in the cervical lymph nodes. *Internat. Abstr. Surg.*, 75: 403, 1942.

RECENT ADVANCES IN THE MANAGEMENT OF BURNS*

CHARLES W. MCLAUGHLIN, JR., M.D. AND DELBERT K. NEIS, M.D.
Omaha, Nebraska

SUCCESS or failure in the management of the severely burned depends upon many factors, but not the least of these is the skill and knowledge of the attendant medical personnel. We have come a long way in the care of burns in the past decade due to the impetus and experience of the last war and the voluminous research carried out during this period. The purpose of this article is to review briefly the pertinent investigative work accomplished since the war years and make some deductions as to its usefulness in the actual care of these patients.

Crassweller and associates[10] in reviewing Farmer's analysis of 1,797 burned patients divided the mortality of burns into four phases, namely, shock, toxic, sepsis and convalescent. This analysis showed a definite improvement in the mortality rate since 1913 in the shock and septic phases but an increased mortality in the toxic phase. They point out that there is no specific treatment for this phase of the injury and that spontaneous recovery or death between the third and the tenth days occurs despite symptomatic measures. It is in this phase that progress will have to be made in order to improve our results in the burned patient.

THE SHOCK PHASE

The initial phase in the course of a severe burn is characterized by shock and lasts for from forty-eight to seventy-two hours after the injury occurs. The first requirement of this period is the relief of pain with intravenous morphine which is superior to subcutaneous morphine. In severely burned patients who are in shock, subcutaneous morphine will be absorbed slowly and the patient will not receive immediate benefit. Care must be taken not to produce over sedation and respiratory depression. It has also been found that morphine alone does not relieve the pain in severe burns; but when pressure dressings are applied, the pain is often completely relieved and very little sedation is needed.[16]

The cause of shock following burns has been a controversial subject among surgeons as well as research workers. It is certain that pain alone is not a sufficient explanation. Brooks and associates[6] found that a sludging of the blood occurred with 30 per cent burns of the body surface in dogs and rabbits, which is comparable to a second degree burn in man. This sludging was found not only in the burned vessels but also in nearly all vessels of the body. This phenomenon was noted almost immediately, and as early as one or two minutes after a burn clumps of red cells were visible in the arterioles, capillaries and postcapillary venules. They found that usually within half an hour, and not more than an hour, the greater part of the whole circulating blood was changed to a homogeneous sludge. Concurrently with the clumping of the red cells it was noted that the white blood cells became adherent to the inner surface of the walls of the small venules, either temporarily or for as long as an hour. This caused a reduction in the effective diameter of the vessels with reduced rate of blood flow through the small vessels. At the same time the viscosity of the fluid material between the mass of red cells increased. As the rate of blood flow decreased, masses of agglutinated red blood cells could be seen forming and breaking up in passing venule blood. With slowing of the blood the following points were observed: (1) Slowing of the blood stream to a full stop without apparent leakage of blood fluid from the vessels. (2) Weakening, relaxation, bulging and sacculation of the walls of small veins but no aneurysms of the small arteries were noted. (3) Progressive slowing of the blood stream while the walls of the small venules leaked the fluid part of the passing blood. (4) Appearance of basic masses of agglutinated red cells outside the vessels, probably but not directly observed, by diapedesis through the vessel wall. (5) Oc-

* From the Department of Surgery, University of Nebraska College of Medicine, Omaha, Neb.

currence of small hemorrhages which permitted varying amounts of blood with its agglutinated cells to pass through the vessel walls into the surrounding tissue. (6) Stasis and thrombosis of small vessels. (7) The plugging of arteriole tips by large-sized basic masses of red blood cells which also acted toward stopping blood flow as previously noted.

Sometimes portions of small thrombi were seen to break loose and be carried into the general circulation. They believe that it may be possible or probable that multiple small emboli of sludging masses of cells contribute to necrosis of the liver, lung or other organs by occluding small vessels within their substance.

In severe burns after five or six hours basic masses of red cells were seen in increasing numbers outside the vessel walls, but actual rupture of the vessels was not seen. Thus with the red cells outside the vessels they cease transporting oxygen and contribute to the post burn anemia and to a reduction in the circulating blood volume.

Brooks and his co-workers[6] point out that there are at least two kinds of shock following burns; one in which there is not sufficient loss of fluid to account for the resulting state of shock but for which the mechanism is not yet known, and one in which the known part of the mechanism appears to be the loss of fluid locally into the burn site. If intravascular agglutination of red cells occurs sufficiently suddenly throughout a large portion of the total circulating bed, the rate of blood flow will be reduced promptly enough to cause sudden shock through peripheral failure without excessive fluid loss. These authors believe that it is entirely possible that some substance or substances released from burn tissue could cause the agglutination of red cells in the sludging process and this substance might properly be called a sludge-initiating toxin.

Hemolysis of blood which accompanies burns may also contribute to the decreased blood volume. James et al.[12] have shown experimentally that hemolysis is very great in third degree burns of more than 20 per cent of the body surface, and there is usually a constant increase in the urinary urobilinogen noted on the third day after injury. This probably denotes early hepatic dysfunction and inability to catabolize properly an increasing amount of urobilinogen. These same authors[13] found an early impairment of the liver function in minor to extensive third degree burns, as judged by changes in the liver function tests employed in their study. The more severe the burn the greater the amount of change in liver function.

Along with hemolysis it has been shown experimentally by McLean, Moritz and Ross[21] that in severely burned animals a rapid rise in plasma potassium levels ordinarily considered incompatible with life may result. In a study of potassium levels in burned patients Ross and associates[22] have shown two principal mechanisms which could cause circulatory failure and death. In one peripheral vascular collapse is brought about by conducting heat to the interior of the body causing systemic hyperthermia via the blood stream, leading to a rapid fall in blood pressure and failure of the circulation. In the other type circulatory failure is principally central due to a high concentration of released erythrocytic potassium in the plasma. Either of these two types may be complicated by the effects of the other. It has been determined by McLean and associates[17] that in a state of shock, sensitivity to potassium is often six to nine times above that normally found. However, it has also been demonstrated that excessive potassium is rapidly removed; and if a burn patient survives one hour, the plasma potassium level is greatly reduced. From the foregoing comments it is apparent that in treating a patient for burn shock it is not merely a problem of replacing plasma loss, but rather a replacement of the circulating volume including red cells, electrolytes and water.

All burned patients are considered emergency cases and should be treated as such. If the patient is to be transported a distance from the site of the injury, the emergency treatment before transportation should be that of draping the patient in a clean or sterile sheet and administering an initial narcotic for the relief of pain. If the patient has associated injuries such as a fracture, these should be treated by first aid measures before transportation is undertaken.

We believe that all burned areas should be considered as open wounds, and these are best dressed in an operating room where the optimum possible sterile technic can be carried out. When the patient arrives at the hospital, a definite plan of therapy should be followed.

Until blood and plasma are available the treatment can be started by using 5 per cent

glucose in sodium chloride. The improvement in shock following intravenous glucose in sodium chloride will only be temporary, and plasma which is the fluid of choice should be started as soon as possible. There are many rules for the amount of plasma to be administered, but probably the best is the clinical response of the patient correlated with the hematocrit determinations and urinary output. It is usually a deficient rather than an excessive amount of plasma that causes fatalities. Brown and Dziob[7] have commented that untoward effects of plasma or whole blood in average doses are unusual in the absence of pulmonary burns.

Whole blood should be administered as soon as possible or when available. We do not hesitate to give it even in the presence of hemoconcentration. This replaces the cell mass lost and prevents the post-burn anemia seen in the convalescent stage. The amount depends on the severity of the burn and the clinical status of the patient. Our working rule is to give 500 cc. of whole blood each day for three days and then as indicated by the blood picture.

Electrolyte solutions by mouth are valuable in the treatment of the shock seen in burn patients. Rosenthal and associates[23] found that the body because of its need for the sodium ion following burns retains large amounts of isotonic sodium chloride solution. This sodium retention which may persist for ten to twenty days as determined by urinary secretion of sodium results from a sodium potassium imbalance which develops during the acute shock phase. Brown and Dziob,[7] and Rosenthal[24] demonstrated experimentally that salt solution reduced the mortality in burn shock in animals and that it is more efficacious if given orally. Moyer and associates[18] recommend an oral solution of normal saline and sodium bicarbonate, composed of sodium chloride, 129 mm., and sodium bicarbonate, 25 mm., Ringer's lactate, 137 mm. base and sodium lactate, 27 mm. Such a solution if taken cool is often palatable in amounts up to 6 to 8 L. per day.

Wide clinical experience has demonstrated that the giving of saline-bicarbonate or saline-citrate solutions by mouth or by intragastric tube is effective in improving burn shock. These should be offered early or as soon as nausea and vomiting permit. The amount to be administered is determined by the clinical response of the patient as well as laboratory criteria. The administration of these fluids orally has been recommended for general use by the Surgery Study Section to the National Securities Resource Council in individual burns and in the event of a national disaster.

Recently there has been some interesting investigative work on the use of heparin in burns. Alrich[2] found in experimental animals during the interval between twelve and thirty hours an appreciable amount of plasma and protein returned to the circulating blood in heparnized animals as compared to a control group. Heparin was thought to act by reducing the amount of coagulation of exudate in the tissues and lymphatics. The mortality in this experimental group, however, was 29.4 per cent as compared to a zero mortality in the control group, so they concluded that heparin should not be used clinically. McCleery et al.[15] believe that heparin speeds the process of normal tissue repair by earlier neutrophilic infiltration, by vascular regeneration with a reduction of the length of time that sludging is present and by fibroblastic proliferation. Parsons and associates[19] found in experimental animals that heparinization alone resulted in less tissue loss and gangrene did not appear in the heparinized animals until two days after it appeared in the controls. Elrod and associates[11] in animal experiments found that heparin increased significantly the survival time of those receiving lethal burns, the beneficial effects being accompanied with improved renal function as evidenced by a smaller rise in the non-protein nitrogen and increased urinary output. They also found a decrease in expected hemoconcentration, probably due to a better return of fluid and albumin to the circulation by the lymphatics. They offer a theoretic concept suggesting a chemical alteration by heparin of a protein toxin.

To date there is almost no data on the clinical use of heparin in severely burned patients and we have not used it with these cases. While on a laboratory basis it may be found useful as an adjunct in the shock phase, it is still a very potent agent and its value in burns must be considered in the investigative stage at the present time.

THE TOXIC PHASE

At the end of forty-eight or seventy-two hours the severely burned patient who survives passes from the shock phase into the second

more critical toxic phase. The voluminous work on burns in the past decade has been primarily concerned with the initial or shock period with a striking reduction in its mortality. The toxic phase which follows and usually lasts from five to seven days continues to carry a distressing mortality and is confusing since we have had so few agents to assist the patient through this period.

Recently cortisone and ACTH have been added to our therapeutic regimen in burns. The results in only a few patients treated with these drugs have appeared in the literature to date, and we have had an opportunity to try cortisone thoroughly in only one major burn. Its action is probably during the period of so-called adrenal exhaustion which may play a part in the mortality of this phase.

Crassweller and associates[9] in comparing the striking parallelism between the physiologic changes following burns and the physiologic effects of ACTH and cortisone suggest that a relationship might exist between the defense response to burn trauma and the action of these substances. Experimentally they gave cortisone to burned mice for four days after the burn, the period when the so-called toxic effects of the burn were to take place, and found a definite decrease in mortality in the cortisone treated animal as compared to controls. These authors believe that clinically cortisone should be given in adequate amounts for the body to meet the emergency, thus supplementing the output from an exhausted adrenal. They point out that the administration of ACTH might not be expected to be useful if the adrenal gland is already exhausted. Therefore it would seem logical to assume that cortisone should be used as a replacement therapy until the adrenal gland regains its normal function after the emergency period or toxic phase of three to ten days.

The question arises as to the continued use of cortisone or ACTH in a burned patient past the tenth day or beyond the toxic phase, since clinical and experimental work indicates that these drugs delay the formation of granulation tissue and hence wound healing. Ragan and associates[20] showed a delay in granulation tissue production in rabbits treated with cortisone at both five and eight days following operation, while the controls showed good granulation tissue growth. They suggest that the action of cortisone and ACTH on mesenchymal tissue is due, at least in part, to inhibition of reactivity of the connective tissue. Baker and associates[3] found that when rats were given ACTH there was thinning of the skin which was due largely to a reduction in thickness of the subcutaneous layer of loose fibro-elastic connective tissue and fat. This was found to be most marked with the larger doses of ACTH. They also found evidence of retarded development of hair follicles. Baxter and associates[4] observed in a study of wound healing in man under control conditions and therapy with ACTH that wounds of skin and subcutaneous tissue showed a variable and apparently unpredictable response in different individuals. They believe that because some patients showed delay in wound healing and others did not may be due to either a variation in adrenal response or in reaction of tissues to the same amount of adrenal hormone.

Dermatome donor areas were studied in two patients by these authors. Both showed clinically healed donor areas on the eighth and ninth days postoperatively, but microscopically one patient showed more mature healing in the control area than in the treated area. ACTH failed to prolong the survival time of the epithelium of a homograft in one case.

Crassweller and associates[10] report two children and one adult with severe burns recently treated with cortisone in addition to other usual therapeutic measures. The two children with second and third degree burns of 55 per cent and 30 per cent body surface succumbed on the fifth and twenty-fourth days, while the adult with the 70 per cent burn recovered. The autopsy in the first child was negative except for the burns, the adrenals containing adequate sudanophilic material. In the second child the postmortem sections of the adrenals showed a marked reduction of sudanophilic material in the fasciculi and the reticularis, interpreted as being indicative of adrenal exhaustion. The adult aged twenty-one recovered in spite of a mortality table probability of less than a 5 per cent chance with modern therapy. He experienced a remarkable state of well-being amounting almost to euphoria under cortisone therapy and was able to take and assimilate from 4,000 to 7,000 calories per day under treatment.

Adams and associates[1] report the use of ACTH in three severely burned children. These patients, age seven, four and eleven, were given from 10 to 20 mg. of ACTH every six to eight hours for variable periods of from two to forty

days. In each instance they observed prompt improvement as evidenced by a cooperative patient, a striking increase in appetite with a dramatic rise in caloric intake. In no case was any adverse effect noted on healing with subsequent grafting.

In determining the value of ACTH or cortisone many problems must be evaluated. Certainly the extent of the burn must be determined in all three dimensions. As pointed out by Tamerin,[26] one of Whitlaw's patients excreted 900 cc. of urine in the first twenty-four hours with no noted intravascular hemolysis and no hemoglobinuria. Its absence would indicate that the volume of burn destruction was not great as intravascular hemolysis and hemoglobinuria are signs of severe thermal destruction. This same author states he is not ready to question the effects of ACTH on spontaneous epithelization of the burn wound, but he cautions against postponement of skin grafting in areas that require an elastic skin envelope to function properly. Tamerin reports one personal case in which ACTH was not life saving, and he encountered prolific granulation tissue on which homografts did not successfully grow.

While some of this evidence is conflicting and perhaps enthusiastic, it seems evident that we have in ACTH and cortisone agents which may offer real assistance in the toxic phase. We have had an opportunity to try cortisone in only one severely burned patient to date; a girl of fifteen years admitted with second and third degree burns involving over 40 per cent of the body surface.

CASE REPORT

Y. M., a fifteen year old white female, was admitted to the University Hospital on January 19, 1951, with the history of being burned approximately four hours before admission when a stove exploded and her clothes caught fire. On admission she was treated for shock with intravenous fluids, plasma and blood. During the first thirty-four hours she received 1,750 cc. of plasma and 500 cc. of blood. She made a good clinical response but her urinary output was depressed the first twelve hours. During the next twenty-four hours there was an improvement, excreting 780 cc. Her urine was clear until the fifth day when it was definitely amber colored, which cleared rapidly in the next twenty-four hours and remained so with an adequate output. During the first twenty-four hours she had some nausea and vomited 600 cc. Following this she was able to take food and fluid by mouth in adequate amounts. On the fifth day cortisone was started giving 150 mg. intramuscularly daily until the forty-second day. During this time she had an excellent appetite and exhibited some euphora. On the twenty-eighth day the patient had some nausea and vomiting which was followed with acute gastric distention. She was treated with gastric suction, intravenous fluids, blood and plasma. On the thirty-third day intravenous potassium, 1.5 gm., and ammonium chloride, 20 gm., were given with marked improvement of the alkalosis. On the thirty-eighth day food and fluids were again started orally and subsequently she had no difficulty and continued to have a good appetite. After the seventieth day she took a diet containing an average of 3,500 calories. (Table 1.)

TABLE 1

PATIENT Y. M., FLAME BURNS, 60% OF BODY SURFACE (40% THIRD DEGREE BURNS, 20% FIRST AND SECOND)

Days	Hemoglobin	Pack Cell Volume	Chloride	Protein	Nonprotein nitrogen	CO_2	Eosinophils
14	15.7	..	460	6.53	..	..	50
18	13.6	..	438	6.63	..	..	38
21	15.4	..	440	5.80	..	..	25
25	14.6	45	422	5.74	..	..	13
27	14.4	..	....	....	..	..	..
28	15.7	40	427	5.09	..	..	38
29	....	..	433	....	..	55	..
32	16.4	..	366	5.83	..	79	None
33	16.3	..	555	....	*	84	..
34	15.2	..	455	....	..	52	..
35	14.8	..	466	5.72	..	..	1
39	14.4	..	505	5.01	..	..	38
42	14.0	43	400	4.91	..	..	38
46	14.0	..	461	4.38	..	..	..
49	....	50	466	5.84	..	..	..
50	16.3	..	....	....	..	..	..
53	15.7	..	644	....	..	54	..
56	12.2	35	466	5.15	†	..	..
60	11.9	35	466	5.81	..	..	..
63	12.8	39	455	5.04	..	..	..
67	13.2	..	....	5.32	..	..	..
68	14.4	..	572	....	..	..	13

* 20 gm. ammonium chloride and 1.5 gm. potassium chloride intravenously

† Cortisone 75 mg. three times a day started

We believe that the change in her condition occurring on the twenty-eighth day was due to a state of sodium retention and hypopotassemia, probably caused by the cortisone. It was during this period that her eosinophil count was so low, indicating an excessive dose of cortisone. The cortisone was stopped on the

forty-second day and started again on the fifty-sixth day, in dosage of 25 mg. three times a day. Following this the patient continued to have a good caloric intake but continued to lose weight. We believe that this was due to a continued protein catabolism, which is often caused by prolonged administration of cortisone. (Table II.)

TABLE II

PATIENT Y. M., FLAME BURNS, OBSERVATIONS

Days	1	2	3	4*	5†	6‡	7§	8	9	10	11
Hemoglobin	.....	18.1	15.7	16.9	13.2	15.2	14.8	14.8	.....	.....	16.9
Pack cell volume	59–56%	47–48%	51–50%	53–57%	47–46%	48%	48%	.....	50%	.....	.....
CO_2	.....	50	.....	49.4	56	.....	.....	.....	.....	.....	.....
Chloride	.....	383	.....	383	359	459	.....	.....	.....	.....	449
Protein	.....	.....	.....	6.59	.....	6.82	6.22	6.19	6.36	.....	6.83
Non-protein nitrogen	.....	52	.....	35	24	.....	.....	.....	.....	.....	.....
Eosinophils	.....	.....	.....	None	None	13	88	175	75	.....	50
Plasma	500	1,250	.....	500	500	.....	.....	.....	.....	.....	.....
5% dextrose in water	.....	1,000	1,000	1,000	1,000	.....	.....	.....	.....	.....	.....
Lactate ringers	1,000	.....	.....	.....	.....	1,000	.....	.....	.....	.....	.....
5% dextrose in NaCl	1,000	1,000	1,000	.....	.....	.....	.....	.....	.....	.....	.....
Blood	500	.....	500	.....	500	.....	.....	.....	.....	.....	.....
Amigen	.....	.....	.....	1,000	.....	.....	.....	.....	.....	.....	.....
Oral	495	600	340	900	1,140	760	2,230	1,600	1,860	2,210	2,400
Urinary output	.....	780	525	2,500	2,900	3,100	2,300	1,500	1,275	2,375	1,250

* Liquid diet
† Soft diet; cortisone 50 mg.
‡ Cortisone 150 mg. daily until forty-third day
§ High protein, high carbohydrate diet

The cortisone was discontinued on the eighty-third day and the patient continued to have an excellent appetite and gained weight slowly. She received a total of 7,300 mg. of cortisone. After the cortisone was discontinued all grafts that had previously been applied continued to grow.

Following the termination of cortisone therapy the eosinophil count returned to normal. The serum protein remained within normal limits.

Eight major grafting procedures were required to cover the burned areas, with 100 per cent take on six occasions and 85 per cent and 40 per cent take on two occasions. (Table III.)

Our impressions from this limited experience supplemented by a review of the other recorded cases may be summarized as follows: (1) ACTH or cortisone is worthy of additional clinical trial in the toxic phase of burns, or from the third to the tenth day. On theoretic grounds cortisone should be the drug of choice. (2) The most dramatic effect is in the striking euphoria evidenced by a state of well being, an amazing appetite and an almost phenomenal caloric intake. (3) After the tenth to fifteenth day relatively little benefit was observed. There is some evidence that prolonged administration may be contraindicated. (4) Both ACTH and cortisone delay fibraplasia but have little effect on epithelization. (5) In average doses and if not continued for too long a period, one may expect grafts to take as in a normal burn if other essential factors are adequately controlled.

LOCAL CARE OF THE BURN

At the present time there are two accepted methods of caring for the burned area, employing either pressure dressings or the exposure method. As soon as initial shock is overcome with the administration of indicated fluids, care should be directed toward the management of the open burn. We prefer pressure dressings but recent reports make us cognizant of the value of the exposure method.

In dressing the burn after removing the original tentative dressing, a rough estimate is made of the area and depth of the body surface involved. We prefer the classification of Lund and Browder.[14] If gross contamination is present, the wound is gently irrigated with ade-

quate amounts of saline; otherwise we do not recommend any type of wound cleansing. All loose skin tabs are removed by débridement but care is taken not to rupture blisters if present. We advise against prolonged débridement as it may increase fluid loss, blood loss, increase pain and thus increase the degree of shock. For the dressing we employ 44 mesh gauze impregnated with liquid petrolatum. These strips of gauze are applied smoothly over the burned areas after which cellulose-cotton gauze or sterile white mechanics paste is evenly applied over these areas, and the dressing held in place by wrapping firmly with stockinette cut on the bias. In applying these dressings care must be taken to distribute the pressure evenly so as not to interfere with blood supply or necrosis may result over bony prominences.

TABLE III
PATIENT, Y. M., FLAME BURNS, TREATMENT

Caloric Intake		
Days	Diet	Average
1st to 5th	Fluids	900
6th to 28th	High protein	3,500
29th to 37th	Intravenous feedings	400
38th to 70th	Protein diet	1,400

Cortisone Medication		
Days	Dose	Appetite
5th to 42nd	150 mg. daily	Good
56th to 70th	25 mg. three times a day	Improving

Grafts	
Eight major graftings	Six, 100% take One, 85% take One, 40% take

This dressing is usually left on for from ten to twelve days after which time the burned areas are reinspected. If granulation tissue is clean and the patient's condition warrants, grafting is carried out immediately at the time of the first dressing in suitable areas. At this dressing we do not hesitate to remove sloughs; and if the bleeding is not too extensive or can be controlled by hot packs, these areas are immediately grafted. Otherwise we apply a pressure dressing incorporating many urethral catheters for saline irrigation. We find that this latter type of dressing will aid in cleaning up infection and also speeds the separation of slough, so that early grafting is possible.

Penicillin is routinely employed in the early phases of burn therapy and also during the stage of grafting, but we are convinced that penicillin has no effect on established infection in a granulating burn wound. All patients with burns are given tetanus toxoid or antitoxin early as the chance of contamination with the tetanus bacillus is great.

As soon as the patient is able to take nutritive fluids by mouth he is started on a high protein, high carbohydrate diet with large doses of vitamins, particularly vitamin C. We emphasize the importance of constant attention to the patient's nutrition as this aids in the early grafting and the success of graft takes.

In the exposure method of treatment the objective is to keep the wound sterile and dry. Copeland[8] in 1887 first described this method, and in 1905 Sneve[25] presented its practical advantages. Wallace[27] points out the following objectives in any form of local treatment: (1) produce a condition of the burned surface unfavorable to the growth and multiplication of bacteria by the production and maintenance of a dry surface if possible, the exposure of the surface to light if possible, and reduction of the temperature of the surface to that of its environment; (2) apply an antiseptic which is bland to tissue cells; (3) provide rest of the affected part by immobilization; (4) limit edema by elevation; and (5) render nursing care simple.

In treating the burned area Wallace cleans the open portions with a 1 per cent cetavlon, the blisters are opened and the raised skin is removed. Following this the burned surface is dried and insufflated with penicillin, using the calcium salt of penicillin diluted with lactose, 10,000 units per cc. All sorts of organisms may fall on the burned surfaces; but if they are dry, no harm is said to result. Blocker[5] does not apply any type of local preparation; but when the dried areas crack, he recommends placing gauze moistened in saline over the cracks to cover these areas. He recommends removing the slough as soon as possible and grafting before infection takes place. He reports the use of this method on seventy patients with second and third degree burns involving 40 to 50 per

cent of the body surface with good results. He believes that in this series the hospital stay was shortened and considers it the method of choice for both superficial and deep burns.

Wallace[28] believes that the outstanding features of the exposure method have been as follows: a more effective control of infection; transfusions have never been required in the second week or later; and no loss of appetite was observed by him.

While we have had no experience with the exposure method, many of us remember the problems encountered during the tannic acid and the tannic acid silver nitrate era in which great difficulty was encountered in keeping exposed areas dry. Certainly such a method would seem to require a great deal more nursing care which in itself offers a real problem in our modern hospitals. That this method could materially reduce the necessary administration of transfusions in severe burns if grafting is to be successfully undertaken is certainly open to question.

THE CONVALESCENT PHASE

This is the final period covering weeks or months after the patient has survived the shock and toxic phases and is left with large open areas devoid of skin. It is this phase which is often referred to as the septic phase for in this period extensive sepsis often is present, ultimately leading to death of the patient.

The objective of this convalescent period is the complete coverage of all open areas by new skin in the least possible time. Grafting is invariably necessary in third degree burns of any extent and in many areas of second degree burns in which infection has produced further damage. Grafting should be started as soon as feasible, preferably by the time of the second burn dressing with particular efforts directed toward covering the neck, axilla and all joint areas at the earliest possible time.

Experience has shown that areas which still show limited infection may be covered by new skin, providing the red blood cell count, the hemoglobin and the serum-protein levels are maintained at high normal readings. In addition it is our practice to maintain a vitamin C intake of at least 500 mg. per day during this period. A definite schedule of redressment is established at intervals of one week with grafting on each occasion. If in this schedule there is planned preparation of a new area for covering at the next redressment, this phase of these very debilitating and costly injuries can be brought to an earlier and more satisfactory termination.

REFERENCES

1. Adams, F. H., Berglund, E., Balkin, S. G. and Chisholm, T. Pituitary adrenocorticotropic hormone in severely burned children. *J. A. M. A.*, 146: 31–33, 1951.
2. Alrich, M. E. The effect of heparin on the circulating blood plasma and proteins in experimental burns. *Surgery*, 25: 676–680, 1949.
3. Baker, B. L., Ingle, D. W., Li, C. H. and Evans, H. M. Growth inhibition in the skin-induced by parenteral administration of adrenocorticotropin. *Anat. Rec.*, 102: 313–325, 1948.
4. Baxter, H., Schiller, C. and Whiteside, J. H. The influence of ACTH on wound healing in man. *Plast. & Reconstruct. Surg.*, 7: 85–99, 1951.
5. Blocker, T. G. Local and general treatment of acute extensive burns, the open-air regime. *Lancet*, 1: 498–501, 1951.
6. Brooks, F., Dragstedt, L. R., Warner, L. and Knisely, M. H. Sludged blood following severe thermal burns. *Arch. Surg.*, 61: 387–418, 1950.
7. Brown, R. K. and Dziob, I. M. Primary treatment of extensive burns. *Am. J. Surg.*, 79: 288–294, 1950.
8. Copeland, W. P. The Treatment of Burns. *Med. Rec.*, 31: 518, 1887.
9. Crasweller, P. O., Farmer, A. W. and Franks, W. R. Experimental burn studies, including treatment with cortisone-active material extracted from urine. *Brit. M. J.*, 2: 242–245, 1950.
10. Crasweller, P. O., Farmer, A. W., Franks, W. R. and McLachlin, A. D. Three cases of severe burn treated with cortisone. *Brit. M. J.*, 2: 977–981, 1950.
11. Elrod, P. D., McCleery, R. S. and Ball, Con D. T. An experimental study of the effect of heparin on survival time following lethal burns. *Surg., Gynec. & Obst.*, 92: 35–42, 1951.
12. James, G. W., III, Purnell, O. J. and Evans, E. I. The anemia of thermal injury. I. Studies of pigment excretion. *J. Clin. Investigation*, 30: 181–190, 1951.
13. James, G. W., III, Purnell, L. J. and Evans, E. I. The anemia of thermal injury. II. Studies of liver function. *J. Clin. Investigation*, 30: 191–199, 1951.
14. Lund, C. C. and Browder, N. C. Estimation of areas of burns. *Surg., Gynec. & Obst.*, 79: 352–358, 1944.
15. McCleery, R. S., Schaffarzick, W. R. and Light, R. A. An experimental study of the effect of heparin on the local pathology of burns. *Surgery*, 26: 548–566, 1949.
16. McLaughlin, C. W., Jr. Treatment of major burns in naval warfare. *Nebraska M. J.*, 31: 11–19, 1946.
17. McLean, R., Moritz, A. R. and Ross, A. Studies of thermal injury. VI. Hyperpotassemia caused by cutaneous exposure to excessive heat. *J. Clin. Investigation*, 26: 497–504, 1947.

18. Moyer, C. A., Coller, F. A., Iob, C. and Vaughan, H. H. A study of the interrelationship of salt solutions, serum and defibrinated blood in the treatment of severely scalded, anesthetized dogs. *Ann. Surg.*, 120: 367–376, 1944.
19. Parsons, R., Jr., Alrich, E. M. and Lehman, E. P. Studies on burns. v. Experimental study of the effect of heparnization and gravity on tissue loss resulting from third degree burns. *Surg., Gynec. & Obst.*, 90: 722–724, 1950.
20. Ragan, C. R., Howes, E. L., Plotz, C. M., Meyer, K. and Blunt, J. W. Effect of cortisone on production of granulation tissue in the rabbit. *Proc. Soc. Exper. Biol. & Med.*, 72: 718–725, 1949.
21. Ross, R., Weisiger, J. R. and Moritz, A. R. Studies of thermal injury. vii. Physiological mechanisms for death during cutaneous exposure to excessive heat. *J. Clin. Investigation*, 26: 505–519, 1947.
22. Research on burns. *Lancet*, 2: 635–641, 1950.
23. Rosenthal, S. M. and Tabor, H. T. Electrolyte changes and chemotherapy in experimental burn and traumatic shock and hemorrhage. *Arch. Surg.*, 51: 244–252, 1945.
24. Rosenthal, S. M. Experimental chemotherapy of burns and shock. *Pub. Health Rep.*, 58: 513–522, 1948.
25. Sneve, H. The treatment of burns and skin grafting. *J. A. M. A.*, 45: 1–8, 1905.
26. Tamerin, J. A. ACTH and burns. *J. A. M. A.*, 145: 925, 1951.
27. Wallace, A. B. Treatment of burns. *Med. Press*, 225: 191–194, 1951.
28. Wallace, A. B. The exposure treatment of burns. *Lancet*, 1: 501–504, 1951.
29. Whitelaw, M. J. and Woodman, T. W. The treatment of severe burns with ACTH. *J. Clin. Endocrinol.*, 10: 1171, 1950; and Whitelaw, M. J. Physiological reaction to pituitary adrenocorticotropic hormone (ACTH) in severe burns. *J. A. M. A.*, 145: 85–88, 1951.

Actinomycosis of the breast may be secondary from the lung by direct extension through the chest wall, or primary. Early cases resemble an acute mammary abscess. Incision and drainage plus antibiotics usually effect a cure. Advanced cases with multiple chronic abscesses and numerous fistulous openings occasionally require simple mastectomy in addition to preoperative and postoperative therapy with the sulfa drugs, antibiotics (especially penicillin) and general supportive treatment. Some of these patients have had repeated breast abscesses with discharge of yellow pus through the nipple—a characteristic history that should make the surgeon suspect the presence of the actinomyces bovis. (*Richard A. Leonardo, M.D.*)

A SURVEY OF CONGENITAL HEART DISEASE IN A CHILDREN'S HOSPITAL*

WITH SPECIAL REFERENCE TO SURGICAL TREATMENT

J. J. McALEESE, M.D.

Pittsburgh, Pennsylvania

SO completely has the outlook of patients with congenital heart disease changed with the introduction of safe surgery that it seems proper at this time to review the experience with congenital heart disease at The Children's Hospital of Pittsburgh during the past five years as representative of present trends in this rapidly changing field.

TABLE I

CONGENITAL ANOMALIES ACCOMPANYING 398 CASES OF CONGENITAL HEART DISEASE

Mongolian idiot	17
Severe neurologic anomalies	12
Orthopedic anomalies	4
Traceo-esophageal fistula	7
Miscellaneous (biliary atresia, diaphragmatic hernia, anomalies of intestinal rotation, etc.)	21
Total cases	61

General Review of Clinical Material. During the five-year period from 1946 to 1950 inclusive the diagnosis of congenital heart disease was made on 398 patients. This represents 1.45 per cent of the 27,500 patients admitted and 47 per cent of the patients in whom a diagnosis of heart disease was made during this period.

One hundred eight patients died while in the hospital and autopsy examination was permitted on seventy. Of those patients living at the time of discharge, sixty-four had severe symptoms attributable to the heart lesion.

Other serious congenital malformations were present in sixty-one patients, an incidence of 15 per cent. Prominent among these anomalies were mongolian idiocy and severe neurologic anomalies. (Table I.)

A résumé of the relative frequency of specific types of heart lesions in 328 living patients is presented in Table II. Diagnoses were made by clinical examination aided by roentgenologic and electrocardiographic studies. Angiocardiography and cardiac catheterization were not available. The large number of cases in which a specific diagnosis was not made demonstrates the difficulty of diagnosis in infancy and the complexity of these lesions which are so often multiple. The diagnosis of possible congenital heart disease was used to describe those patients with asymptomatic, atypical heart murmurs. The age incidence of these cases is shown in Figure 1 which demonstrates the high mortality in the first year of life, a generally recognized feature of congenital heart disease. Approximately one-half of these

TABLE II

FREQUENCY OF CONGENITAL CARDIAC LESIONS ACCORDING TO CLINICAL DIAGNOSIS

Acyanotic:	
Interventricular septal defect	37
Patent ductus arteriosus	37
Interauricular septal defect	7
Coarctation of aorta	5
Anomalies of aortic arch	4
Interauricular and interventricular septal defects	3
Dextrocardia	3
Aortic valve anomaly	1
Congenital aortic stenosis	1
Cyanotic:	
Tetralogy of Fallot	42
Eisenmenger's complex	3
Complicated pulmonic stenosis	3
Uncomplicated pulmonic stenosis	1
Tricuspid atresia	1
Transposition of great vessels	1
Truncus solitarius	1
Miscellaneous:	
Congenital mitral stenosis	1
Lutembacher's syndrome	1
Congenital heart disease with rheumatic heart disease	7
Congenital heart disease, unspecified type	132
Possible congenital heart disease	37
	328 Cases

* From the Surgical Service of The Children's Hospital of Pittsburgh and the Department of Surgery, University of Pittsburgh, School of Medicine, Pittsburgh, Pa.

patients were seen when under two years of age.

Figure 2 shows the sex incidence in all cases as well as in those most commonly requiring surgery. This figure confirms the well known observation that most patients with patent ductus arteriosus are females and most patients with coarctation of the aorta are males.

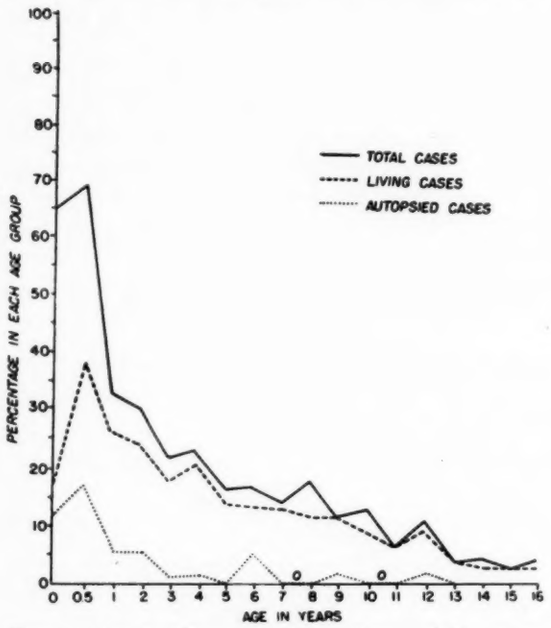


FIG. 1. Age incidence of 361 patients with unquestioned congenital heart disease. Thirty-seven patients with possible but not established congenital heart disease excluded.

Review of Autopsy Findings. A review of autopsies where a congenital heart lesion was found revealed that death was directly attributable to the congenital heart lesion in forty-seven of the seventy autopsy protocols reviewed. In the remaining twenty-three cases death resulted from other severe congenital anomalies or infectious diseases such as pneumonia, pertussis or meningitis. The incidence of lesions encountered in these forty-seven cases is shown in Table III. Although these findings differ considerably from the incidence of all congenital heart lesions found in an unselected autopsy series, the reason for this is evident when one considers the relative benignancy of certain lesions quite common in the age group under discussion. Particularly is this true of uncomplicated patent ductus arteriosus.

Accurate statistics of the relative incidence of all cardiac lesions at autopsy are difficult to obtain. This is well illustrated by the defect of a patent ductus arteriosus. Although thirty-five cases or one-half of all autopsies had a patent ductus arteriosus, in only nine cases was it pathologic (i.e., abnormally large or in a child over six months of age) and in only four cases was the defect responsible for death. In twenty-one cases the patent ductus arteriosus was the only defect present, but in the remaining fourteen cases it was associated with other more serious defects.

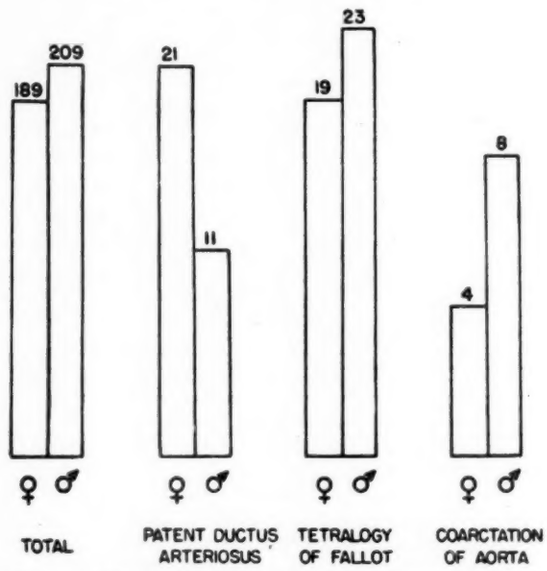


FIG. 2. Distribution of cases of congenital heart disease according to type and subdivision as to sex.

In comparing this small series with the incidence of defects as prepared by Essrig[1] from Abbott's cases it is interesting to note the higher incidence of severe defects in this series of cases, which are as a group younger than Abbott's.

One cannot but be impressed by the multiplicity of lesions found at autopsy and the relative rarity of single uncomplicated lesions. This is well illustrated by the nine cases of coarctation of the aorta in which only three were uncomplicated by other serious cardiac anomalies. The importance of this multiplicity in the selection of patients for surgery is obvious.

Surgical Treatment. Forty-seven or approximately 12 per cent of the 398 patients with congenital heart lesions underwent operation. Sixteen older patients operated upon at the other Medical Center Hospitals are included in this review which is based on an

experience with sixty-three cases. Suitable for surgical correction were uncomplicated patent ductus arteriosus, coarctations of the aorta and tetralogy of Fallot. Two patients with tracheal compression due to a vascular ring were operated upon, with one death; these are not included in the present discussion. The experience in the management of each of these will be considered separately.

TABLE III
FREQUENCY OF CONGENITAL HEART LESIONS AT AUTOPSY

	I*		II†		III‡
	No.	Per cent	No.	Per cent	Per cent
Tetralogy of Fallot	16	34	16	22.9	12
Interventricular septal defect	5	10.7	7	10.0	17
Coarctation of aorta	5	10.7	9	12.9	8
Cor triloculare biventricular and cor biloculare, i.e., complete septal defects	5	10.7	5	7.0	1
Transposition of great vessels	4	8.5	4	5.7	2
Patent ductus arteriosus	4	8.5	35	50.0	13
Rudimentary chambers	2	4.3	2	2.9	
Patent interauricular septal defect	1	2.1	23	32.9	20
Pulmonic stenosis	1	2.1	1	1.4	
Tracheal ring and other anomalies of aortic arch	1	2.1	1	1.4	
Abnormal coronary arteries	1	2.1	2	2.9	
Truncus arteriosus	1	2.1	2	22.9	1
Eisenmenger's complex	1	2.1	1	1.4	5
Dextrocardia	0		2	2.9	
Displacement of heart	0		9	12.9	2

* Major anomaly causing death in a series of 47 cases in which death was due to congenital heart disease.

† Incidence of anomalies in 70 autopsies; in many cases more than one congenital heart lesion was found.

‡ Incidence according to Essrig as derived from Abbott's cases.[1]

Surgery for patent ductus arteriosus or a coarctation of the aorta is designed to correct the congenital defect by closure of an abnormal communicating vessel in one case, and by the resection of an area of atresia or stenosis in the other. As one would expect, the results in these cases are very good. However, the presently standardized procedure for those cases of decreased pulmonary artery blood flow amenable to surgery such as the tetralogy of Fallot actually creates a new defect, an artificial patent ductus arteriosus.

TETRALOGY OF FALLOT

Operative experience in the surgery of tetralogy of Fallot at Children's Hospital consists of fourteen patients, with an additional three patients being operated upon at the other Medical Center Hospitals. The Blalock[2] procedure or the Potts[3] procedure was attempted in fifteen and completed in only ten cases. Six of these patients are now living.

In one case an exploratory thoracotomy revealed Eisenmenger's complex, and in the latest case a successful valvulotomy of the pulmonary infundibular web as described by Brock[4] was done. Table IV summarizes the causes of death in each of the eight fatalities.

TABLE IV
CAUSES OF DEATH IN SURGERY FOR TETRALOGY OF FALLOT

Patient	Age (yr.)	Cause of Death
I	3	Cardiac arrest as pulmonary artery was dissected
III	8	Uncontrollable hemorrhage from distal subclavian artery during surgery
IV	6	Cardiac failure 48 hr. postoperatively
V	6½	Respiratory arrest with ventricular fibrillation on removal of endotracheal tube after successful completion of surgery
VII	6	Cerebral embolism 1 hr. postoperatively
VIII	21 mo.	Cerebral embolism 24 hr. postoperatively
IX	12	Cardiac arrest during surgery
XII	6	Cardiac failure 72 hr. postoperatively

The results in those patients surviving the procedure have been excellent in four patients and fair in two. As time went by one patient developed clinical subacute bacterial endocarditis. This was controlled by intensive penicillin therapy. One other patient, an excellent initial result, has since relapsed and reoperation is contemplated.

The advantage of the Potts procedure in young children in poor condition but requiring early surgery was well demonstrated in two successful cases.

The results of other centers are tabulated in Table v. The newer procedures now being developed as a result of Brock's introduction of a direct approach to the stenosed pulmonary infundibulum may well alter the surgical approach to these lesions.

PATENT DUCTUS ARTERIOSUS

Thirty-two patients with patency of the ductus arteriosus were operated upon with two postoperative deaths, a 6 per cent mortality. These fatalities were early in the series,

and twenty-seven consecutive cases have since been done without mortality. Ages of the patients varied from four years to thirty-two years, although the majority were six to eight years of age.

Included among these cases were identical twin girls with identical patent ducti findings at operation. The literature has failed to provide similar cases so this must be an unusual occurrence. Two other patients were siblings.

Symptoms of dyspnea on exertion, frequent attacks of pneumonia, failure to grow, malnutrition and easy fatiguability were present in fifteen patients. The remainder were asymptomatic.

In all cases the diagnosis was made clinically and verified by roentgenologic and electrocardiographic findings. In only one case (not included in this series) was the diagnosis in error at operation. In this case no ductus could be found at exploratory thoracotomy.

One fatality occurred on the fourth postoperative day in a poor risk patient in whom dense fibrosis of the mediastinum secondary to extensive pulmonary disease made the procedure difficult. Death in this case was due to postoperative shock and pneumonitis. The second fatality occurred thirty-six hours postoperatively. The procedure in this case was a simple one and the cause of death could not be determined but was assumed to be due to pulmonary edema incident to closure of a large ductus or to associated congenital cardiac defects.

The anesthesia in most cases was nitrous oxide–oxygen and ether endotracheally administered, with cyclopropane being used in the most recent cases.

The operative technic used in all cases was essentially that originally described by Gross[5] and later modified by Blalock.[6] All cases were ligated in continuity using three encircling mattress sutures of fine silk and two No. 2 Black silk ligatures. Division was not done in any case because of the satisfactory result obtained with this simpler procedure. The ductus was always given a five- to ten-minute trial period of closure before permanent closure was effected, so that compensation for other congenital cardiac defects could be ruled out.

These patients have been notably free from postoperative complications and sequellae. Although recurrent laryngeal nerve palsy, empyema, aortobronchial fistula, wound infections and mediastinitis have been reported,[7] none of these complications occurred in this series.

Final results have been gratifying. In only one case has a continuous murmur returned. In four additional cases a soft systolic murmur due to other defects and a faint pulmonic systolic functional murmur have been noted. In one case a patent interventricular septal defect became evident after closure of the ductus.

This series is compared with results of other centers in Table VI.

TABLE V
REPORTED RESULTS OF SURGICAL TREATMENT OF PULMONIC STENOSIS

Author	No. of Cases	Mortality		Remarks
		No.	Per cent	
Blalock[10]	610	108	17.7	
Potts[11]	181	23	12.7	
	165	16	9.7	Anastomosis done
	16	7	43.8	Explored
Paine and Varco[12]	43	6	14	72% improved 14% unimproved
Holman[13]	38		24	
	7	5	71.4	Exploratory thoracotomy
	29	4	13.8	Anastomosis done
Humphries[14]	16	5	31	
	12	2	17	When anastomosis completed
	4	3	75	When not completed

TABLE VI
REPORTED RESULTS OF SURGICAL TREATMENT OF PATENT DUCTUS ARTERIOSUS

Author	No. of Cases	Mortality		Recanalization	
		No.	Per cent	No.	Per cent
Gross[15]	412	8	2.1		
Scott[16] (Johns Hopkins Hospital)	180	5	2.7	1	
Jones[17] (San Francisco, Calif.)	125	4	3.2	1	
Wangensteen and Varco[18] (University of Minnesota)	69	1	1.5		0
Craaford[19] (Stockholm, Sweden)	71	2	2.8	1	
Potts[20] Chicago, Ill.	40	0	0	0	0
Conklin and Watkins[21]	21	2	9.5		
Shapiro (collective review)	626		4.9		7.8
McAleese	32	2	6	1	

COARCTATION OF THE AORTA

Most gratifying have been the results in the operative correction of coarctation of the aorta.

Although only three such patients have come to surgery at the Children's Hospital of Pittsburgh, the surgical experience of the Medical center includes a total of twelve patients, who ranged in age from ten to thirty-two years. Of these excision of the coarcted segment and successful end-to-end anastomosis of the aorta were accomplished in seven. When this was possible, no mortality occurred and the results were excellent.

It is only fair to say that exploratory thoracotomy carries a considerable mortality when anastomosis is not possible. In the five cases in which only exploratory thoracotomy was done two fatalities occurred. In the first case the patient died twenty-four hours postoperatively of hemorrhage from an intercostal vessel. The second death occurred during the operative procedure when the proximal aorta ruptured as it was being dissected from its bed. In this case associated rheumatic fever and rheumatic heart disease were present and pathologic examination revealed extensive medionecrosis of the aorta at the site of rupture.

The surgical technic followed in each case was that of Gross.[8] No attempt was made to use arterial grafts or to use the left subclavian artery for the anastomosis.

The diagnosis in all cases was made clinically. In the three cases in which angiocardiography was used it proved to be of little value.

In one case a mild postoperative hemothorax requiring thoracentesis occurred, but the remainder of these patients had an uneventful convalescence. In those patients in whom anastomosis was possible the results as far as blood pressure is concerned were immediate and definite. Follow-up studies reveal continuing improvement.

These patients were symptomatic preoperatively, and in all, symptoms were relieved by operation. Perhaps the most dramatic improvement was that of a twenty-one year old farmer who was unable to stand or walk longer than thirty minutes due to weakness of his legs or to drive a tractor because of periods of blackout. This man has been completely rehabilitated and is now able to work his farm without help. Table VII shows the results of surgical treatment of coarctation in other centers.

Although these cases represent the congenital cardiac anomalies where surgery is of proved value, this field is not static. Direct approaches to the various valvular lesions, closure of septal defects, the creation of septal defects and other procedures for the relief of transposition of the great vessels are under study and have been accomplished successfully in limited number in some clinics.[9] That the surgery for congenital heart disease is constantly advancing in scope and safety is apparent.

TABLE VII
REPORTED RESULTS OF SURGICAL TREATMENT OF COARCTATION OF AORTA

Author	No. of Cases	Mortality		Result
		No.	Per cent	
Gross[22]	100	11	11	
Clagett[23]	42	5	11.9	50% cured 90% improved
Hanlon (Blalock[24])	24	3	12.5	
Craaford[24]	32	2	6.2	
Burford[25]	14	1	7.0	"Adult"
	4	4	100	"Infantile"
Jones[24]	13	2	15.4	
Stephens and Grimes[24]	5	3	50	
	9 (Addendum)	1	25	
	15	4		
Adams[26]	5	0		
Potts[27]	5	0		
McAleese	12	2	16.6	

SUMMARY

1. A résumé of the incidence of congenital heart disease as it has been observed at the Children's Hospital of Pittsburgh over the five-year period 1946 to 1950 inclusive has been presented.

2. In this hospital during the period under study 1.45 per cent of the admissions were for congenital heart disease and approximately one-half of all heart disease was congenital.

3. Surgery offers, by correction of the lesion, clinical improvement for patients with patent ductus arteriosus and coarctation of the aorta. It offers considerable clinical improvement for patients with tetralogy of Fallot and allied conditions.

4. Approximately 12 per cent of patients with congenital heart disease in this series were treated by surgery directed at the congenital defect.

5. A series of thirty-two cases of ligation of a patent ductus arteriosus with two fatalities and one recurrence is presented.

6. A set of identical twin girls with identical patent ducti verified by operative closure is included in this series. These are believed to be the first such cases reported.

7. Of twelve patients operated upon for coarctations of the aorta all seven patients in whom anastomosis was completed lived and were subjectively and objectively improved.

8. Surgery for congenital heart disease is constantly advancing in scope and safety to the patient.

REFERENCES

1. Essrig, I. M. Surgical approach to congenital cardiovascular defects. *New England J. Med.*, 240: 15, 1949.
2. Blalock, A. and Taussig, H. B. The surgical treatment of malformations of the heart in which there is pulmonary stenosis or pulmonary atresia. *J. A. M. A.*, 128: 189, 1945.
3. Potts, W. G., Smith, S. and Gibson, S. Anastomosis of aorta of pulmonary artery; certain type in congenital heart disease. *J. A. M. A.*, 132: 627, 1946.
4. Brock, R. C. The surgery of pulmonary stenosis. *Brit. M. J.*, 2: 399, 1949.
5. Gross, R. E. and Hubbard, J. P. Surgical ligation of patent ductus arteriosus: report of first successful case. *J. A. M. A.*, 112: 729, 1939.
6. Blalock, A. Operative closure of the patent ductus arteriosus. *Surg., Gynec. & Obst.*, 82: 113, 1946.
7. Jones, J. C. Complication of the surgery of patent ductus arteriosus. *J. Thoracic Surg.*, 16: 305, 1947.
8. Gross, R. E. Surgical correction for coarctation of the aorta. *Surgery*, 18: 673–678, 1945; Technical considerations in surgical therapy for coarctation of the aorta. Ibid., 20: 1–8, 1946.
9. Blalock, A. A consideration of some of the problems in cardiovascular surgery. *J. Thoracic Surg.*, 21: 543–569, 1951.
10. Blalock, A. Surgical procedures employed and anatomical variations encountered in the treatment of congenital pulmonic stenosis. *Surg., Gynec. & Obst.*, 87: 385–409, 1948.
11. Potts, W. J. Surgery of pulmonic stenosis. *Ann. Surg.*, 130: 342–360, 1949.
12. Paine, J. R. and Varco, R. L. Experiences in the surgical treatment of pulmonic stenosis. *Surgery*, 24: 355–370, 1948.
13. Holman, E. The surgery of pulmonary stenosis. *J. Thoracic Surg.*, 18: 827–835, 1949.
14. Humphries, G. H. II. The diagnosis and treatment of congenital cyanotic heart disease. *Bull. New York Acad. Med.*, 23: 283–291, 1947.
15. Gross, R. E. and Langion, L. A. The patent ductus arteriosus. *Circulation*, 1: 125–137, 1951.
16. Scott, H. W., Jr. Closure of the patent ductus by suture ligation technique. *Surg., Gynec. & Obst.*, 90: 91–95, 1950.
17. Jones, J. C. Surgery of patent ductus arteriosus. *Ann. Surg.*, 130: 174, 1949.
18. Wangensteen, O. W., Varco, R. L. and Baronofsky, I. D. The technique of surgical division of patent ductus arteriosus. *Surg., Gynec. & Obst.*, 88: 62–68, 1949.
19. Discussion on: Complications of the surgery of patent ductus arteriosus. *J. Thoracic Surg.*, 16: 322–327, 1947.
20. Potts, W. J. Surgical treatment of patent ductus arteriosus. *Surg., Gynec. & Obst.*, 88: 571–576, 1949.
21. Conklin, W. S. and Watkins, E., Jr. Division of ductus arteriosus. *J. Thoracic Surg.*, 19: 361–370, 1950.
22. Gross, R. E. Coarctation of the aorta. *Circulation*, 1: 41–55, 1950.
23. Hallenbeck, G. A., Wood, E. H., Burchell, H. B. and Clagett, O. T. Coarctation of the aorta. *Surg., Gynec. & Obst.*, 92: 75–80, 1951.
24. Stephens, H. B. and Grimes, O. F. Coarctation of the aorta. *J. Thoracic Surg.*, 18: 804–806, 1949.
25. Burford, T. H. Coarctation of the aorta and its treatment. *S. Clin. North America*, 1249–1258, 1950.
26. Adams, H. B., Rutledge, D. I. and Sanders, C. R. Coarctation of the aorta. *J. A. M. A.*, 139: 362–365, 1949.
27. Potts, W. J. Coarctation of the aorta. *Ann. Surg.*, 131: 466–472, 1950.

AN EXTRA-ARTICULAR OPERATION FOR RECURRENT DISLOCATION OF THE SHOULDER JOINT

PRELIMINARY REPORT OF CASES

O. C. WILLIAMS, M.D. AND C. W. APPLEWHITE, M.D.

New Orleans, Louisiana *Atlanta, Georgia*

IN March, 1942, Dr. Jacob A. Glassman reported an extra-articular operation for recurrent dislocation of the shoulder joint.[10] The operation is simple and is based upon careful consideration of the anatomy of the shoulder joint and the pathology of dislocation. A review of the literature fails to reveal any published reports of the use of this operation or follow-up of cases so treated. In a personal communication Dr. Glassman states that many individual case reports, all favorable, have reached him, but that none have been published. The authors wish to report the results of a follow-up study of thirteen operations performed on eleven patients in the manner described by Glassman.

The humeroscapular articulation is the most frequently dislocated joint in the body. This, undoubtedly, is the price that must be paid for the fact that it has the greatest range of motion. Only one quarter of the articular surface of the humeral head is in contact with the glenoid at any time. Treatment of an acute dislocation does not present a major surgical problem. However, when the joint is weakened to the extent that it becomes recurrently dislocated, a challenging problem faces the surgeon. Habitual dislocation often occurs with normal motions of the arm and not infrequently while the patient is asleep. This represents a serious disability to the patient incapacitating him for work or producing semi-invalidism. It is a disease most often seen in active young men and is frequently bilateral, its onset is usually an acute traumatic dislocation. Recent investigation suggests that inadequate immobilization of acute dislocations may lead to recurrence. This condition is prone to develop in epileptics due to the violent muscular contractions during seizures.

Many explanations have been given to account for the tendency to recurrent dislocation of the shoulder, some postulating changes in the muscle, some in the capsule and ligaments and others in the bone. Bankart[2] contends that the pathology is always the same, detachment of the glenoid labrum from the anterior aspect of the bone margin of the glenoid. Hill and Sachs[15] emphasize the frequent occurrence of a wedge-shaped deformity in the posterolateral aspect of the humeral head which they believe to be a compression fracture occuring at the time of the original injury, facilitating subsequent dislocation. Their findings are confirmed by others.[1,3,7,29] Magnusen and Stack state that recurrence is the result of "lack of balance, traction and leverage of muscles which ordinarily resist downward and forward displacement of the head."[18] They contend that muscle support is the only important factor in maintaining the humeral head, that the capsule is a lax structure and that in circumflex paralysis the joint is often separated an inch or more in spite of the intact capsule and undamaged bone. From a review of the literature it seems reasonable to state that a tear of the glenoid labrum is found in 60 to 85 per cent of recurrent dislocations. By careful x-ray studies a similar percentage of cases show a defect in the posterolateral aspect of the humeral head. A much smaller number are found to have glenoid fractures or tears of the subscapularis muscle.

Operative correction of this condition offers a most diversified and interesting range of procedures; some designed to correct the postulated defect, some to limit motion of the joint and others to suspend, buttress or strengthen the joint. Two thousand years ago Hippocrates used the white hot cautery plunged into the axilla and insisted that "above all should the arm be continually bound to the side both night and day, for so would the cavity into which the humerus is mostly displaced be best cicatrized up and cut off."

A completely satisfactory operation for the

repair of recurrent dislocation of the shoulder joint has not been generally accepted. The large number of operations now in use and the marked differences of opinion as to the underlying cause of recurrent dislocation ouly serve to emphasize this fact. To be ideal an operation would have to meet certain definite conditions. (1) It would be simple to perform and therefore could be applied widely with uniform results. (2) It would be based upon sound surgical principles to correct the causative defect. (3) It would return the shoulder joint to a normal range of motion. (4) It would result in a shoulder joint free of pain. (5) It would result in a stable joint with no recurrence of dislocation. The authors believe that the Glassman operation meets these requirements more nearly than any of the 200 odd operations and modifications of operations from which the surgeon may choose.

A consideration of the disadvantages of the currently popular procedures leads to the conclusion that no one of them is close to the ideal just described. Operations for recurrent dislocation of the shoulder joint may be classified according to the tissue used to correct the defect. In 1917 Clairmont described an operation using the posterior portion of the deltoid muscle passed under the head of the humerus as a muscle sling. This was the first popular muscle transplant operation but it has been discarded because of frequent recurrence. Magnuson and Stack[18,19] have used the subscapularis muscle, transplanting the insertion from the lesser to the greater tuberosity of the humerus. The recurrence rate reported is low,[18] however, limitation of motion is found in a relatively high percentage of cases and postoperative pain is a frequent finding.[9]

Bankart's operation, which is widely used today, makes use of the capsule. Simple capsulorrhaphy has long since fallen into disrepute. The Bankart operation[2] consists of dissection of the anterior aspect of the shoulder joint, removal of torn or frayed labrum and reattachment of the capsule to the glenoid. This procedure is followed by a low incidence of recurrence.[1,3,6,22,26,31,35] Its general adoption as the procedure of choice has been discouraged by several considerations. That the operation is technically quite difficult is attested by the reports of many experienced and capable surgeons who have used this procedure.[3,4,6,9] Adams,[1] Downing,[6] Meyers,[22] and Odgers and Hark[26] report limitation of external rotation in a significant percentage of their cases. Postoperative pain is reported in a small number of cases. Bankart insists that the detachment of the glenoid labrum is the essential lesion[2] and that defects of the head of the humerus and glenoid fractures are the result of repeated dislocation rather than the cause. Many authors[1,4,7,26,29,34] found the Bankart lesion in 30 to 87 per cent of their cases. Watson-Jones presented a most interesting report of a Bankart operation using the superior approach. The dislocation recurred in spite of excellent exposure and careful repair. He suggests that "Bankart's operation succeeds not alone by virtue of the repair of labrial lesions, but even more by virtue of the operative exposure of such lesions, and the subsequent resuture which limits external rotation movement."[35]

Fascia and tendon provide the material that has been used most frequently in operative attempts to correct recurrent dislocation of the shoulder joint. Nicola, in 1929, reported the use of the biceps tendon which he transplanted through a tunnel drilled in the head of the humerus emerging at the bicipital groove. This operation is losing its once widespread popularity because of the high rate of recurrence which is reported from 20 to 35 per cent.[1,9,18,30] The operation does not approach the difficulty of the Bankart procedure but it does require opening the joint space and drilling into the articular surface. It is usually followed by a moderate degree of limitation of motion, particularly abduction. Persistent aching pain in the shoulder region is observed with disturbing frequency.[1]

Henderson[12–14] devised a tenosuspension operation using a free graft of peroneus longus tendon passed through the acromion process and the upper end of the humerus to form a loop of tendon supporting the joint. This is an extra-articular operation and is not difficult. It does require transplant of peroneus tendon and, therefore, multiple incisions. Unfortunately, Henderson reports recurrences of 26 per cent in a careful follow-up of seventy-two cases.

The operation used by Gallie and Le Mesurier[8] makes a check ligament by passing a strip of fascia lata from the outer margin of the scapula across to the upper portion of the humerus and then to the coracoid process with the intent of limiting abduction. They report only seven recurrences in 175 cases. However,

they do not evaluate postoperative limitation of motion, which must be a very common finding, and no mention is made of postoperative pain. The procedure also requires multiple incisions and extensive extra-articular bone drilling which make this a moderately formidable operation.

Many operations using the biceps tendon have been devised. Crosby[5] reported thirteen patients treated by resuturing the biceps tendon in the bicipital groove following curettage of the floor, with four recurrences. He also reported eight cases in which he passed the biceps tendon through the acromion with one recurrence. Mangels and Robinson[20] transplanted the biceps tendon, intact, into a slot cut from the articular margin to the greater tuberosity to tighten the biceps tendon. They followed up eleven patients for fifteen months without recurrence. Wahl[34] transplanted the proximal end of the severed biceps tendon through the greater tuberosity of the humerus and reported only one recurrence in thirty-one cases followed up from two to six years. All of these operations are extracapsular and are based upon the concept of supporting the humerus by shortening or tightening the biceps tendon. No effort is made to block the anterior motion of the humeral head other than by the ligament at the superior pole. These operations are interesting and suggest promise; however, large numbers of cases, longer follow-up and evaluation of postoperative motion and pain will be required to establish their value.

Combinations of tissue are sometimes used. In the Putti-Platt operation the subscapularis muscle is cut 1 inch from the insertion on the lesser tuberosity of the humerus and the short end is sutured to the glenoid. The muscle end is then sutured to the greater tuberosity or bicipital groove. Osmond[28] and Adams[1] report very low recurrence rates. Adams states that "it results in considerable restriction of external rotation movement.[1] This operation requires that the joint space be entered and entails considerable dissection. It might be thought of as a combined Bankart and Magnuson-Stack operation with a recurrence rate comparable to either of them and the disadvantages of both.

The frequence of recurrence following the use of soft tissue for repair led to the development of operations using bone to block the anterior passage of the head of the humerus. Oudard lengthened the coracoid. Palmer, Speed and Orell used bone grafts from the tibia or ilium applied to the anterior margin of the glenoid. Ilfeld and Holder[16] used a bone graft combined with a Nicola operation. Palmer and Widen[29] found the recurrence rate to be 6.7 per cent in a series of sixty cases using bone block operations; 20 per cent of these patients had limitation of motion.

The extent to which the search for a satisfactory operation has been carried is illustrated by the fact that even foreign bodies have been used to repair the defect. Moseley[23] attached a stainless steel rim to the anterior margin of the glenoid by screws in one case. X-ray films of some patients treated by the Bankart operation using steel staples to reattach the capsule suggest that they should be classified in this group.

The operation devised by Glassman has certain advantages. It is relatively simple to perform. The normal function of the tendon of the long head of the biceps is maintained by leaving half of the tendon in place, however, that portion is tightened by the tension of the transplanted half. The anterior passage of the head of the humerus is blocked by the transplanted tendon. The portion of the tendon which passes through the bone tunnel is not subject to constant trauma as in the Nicola operation. The Glassman procedure does not provide blocks, check ligaments or tightened muscles to interfere with range of motion or produce pain. It does not require the transplant of tendon or fascia from another part of the body. The capsule is not entered and therefore there is no trauma to the articular surfaces or hemorrhage into the joint space with subsequent arthritis or infection.

The only serious disadvantage discovered is that it cannot be performed on a patient with recurrence following a Nicola or other biceps tendon transplant operation. Criticism has been advanced that some of the tendons would be too small to divide and transplant half giving a strong ligament. In none of our patients did we encounter this difficulty; however, in such a case the possibility of similar transplant of the entire tendon would be considered.

The method used on our patients is that described by Glassman. The incision is made from the coracoid process downward to a point 5 cm. from the mid-point of the shaft

of the humerus, with the arm abducted 45 degrees and the forearm in supination. The fibers of the deltoid are separated exposing the capsule and upper third of the humerus. The tendon of the long head of the biceps is freed from its bed as far as the beginning of the

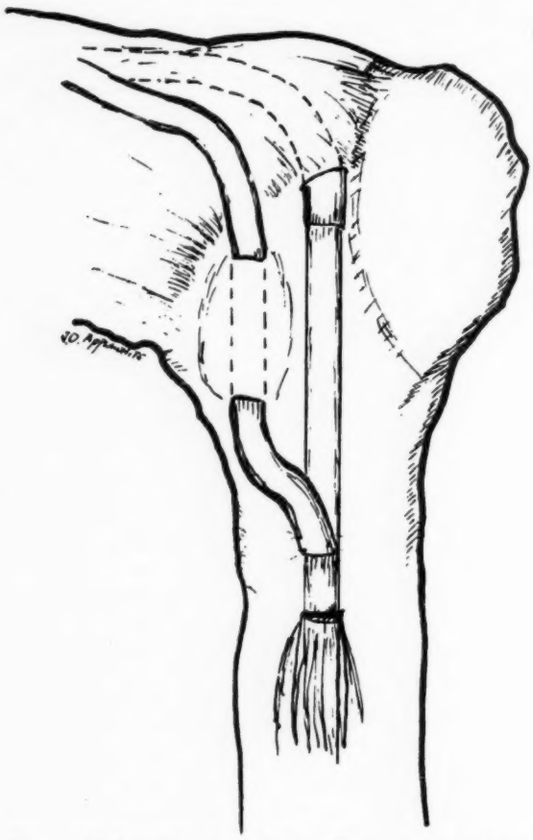


FIG. 1. Schematic drawing to illustrate completed Glassman operation.

muscle belly. Some fibers of the anterior lamina of the tendon of the pectoralis major may be cut along its insertion. The tendon is split lengthwise into ventral and dorsal halves. The dorsal half is severed transversely at its lower end. The elbow is flexed and the arm abducted to 135 degrees. This allows further splitting of the 5 cm. of tendon previously intracapsular. The lower end of the dorsal half of the tendon is fastened to a maleable probe with silk sutures The probe is passed upward against the roof of the capsule and a stab wound made at the point of projection. The probe is then gently pulled through the wound delivering the attached tendon. Using a 5 or 6 mm. bit a tunnel is made in the lesser tuberosity by drilling downward from the apex parallel to the long axis of the humeral shaft for 2.5 cm. The lower end is joined by drilling at an obtuse angle upward from the base of the lesser tuberosity. The tendon is then passed through the tunnel and resutured to the intact portion with the arm in abduction and the elbow flexed. This is done with the transplanted tendon at maximum tautness. As an additional step when there is a lax capsule, the tendon is invaginated in the capsule with interrupted Lembert sutures. (Fig. 1.)

Postoperatively the arm is placed in a Velpeau bandage and maintained for three weeks. This is then removed and the patient carries the arm in a sling. Circumduction exercises are begun, but external rotation and marked abduction motions are avoided as exercises are gradually increased. The patient is allowed to return to light duty at the end of eight weeks and to full duty at twelve.

The authors have performed this operation thirteen times on eleven patients under general anesthesia. In this series there were ten men and one woman. The woman was fifty-eight years of age when the first operation was done. The men varied in age from nineteen to thirty years at the time of operation. The right shoulder was involved in four cases and the left in five. Bilateral recurrent dislocation was found in two of the patients, one man and one woman. All sustained the original injury as a result of severe trauma, football, boxing and falls. None of the patients had been operated upon before for recurrent dislocation, and none had epilepsy. The woman had advanced traumatic arthritis and had been advised elsewhere to have fusion of the left shoulder.

Routine films taken in the usual manner showed no bony deformity except in the patient with arthritis. Seven of the patients had films taken with the arm in internal rotation to show the posterolateral aspect of the humeral head and six of these showed some defect of that surface. (Table 1.)

Postoperative follow-up was carried out by personal examination in seven of the patients and by letter in five. Two of the patients were lost after follow-up of twenty-three and six months had shown no recurrence.

Of the thirteen operations, two reported recurrence of dislocation; however, both patients gave a history of injury severe enough to dislocate the normal shoulder. One of these occurred ten days after discharge from the

hospital, before healing was complete. One patient, who works full time as a house painter, reported a painful shoulder. However, the authors were unable to rule out the possibility of pension playing the etiologic role in the production of pain in this case. Of the remaining patients several are engaged in work involving arduous labor. One of the patients with bilateral operations reports that he can perform on the parallel bars, another served last summer as a lifeguard and boxes occasionally. The patient most recently operated upon states that he plays basketball and is able to use the involved arm for one-handed push shots. All of the patients examined displayed a range of motion of the operated shoulder which is comparable with that of the other shoulder. (Table II.)

TABLE I
CASE MATERIAL

Case	Age at Operation	Sex	Arm	Original Injury	X-ray Findings	
					Routine	Special
S. M.	23	M	L	Fall	Negative	Small defect
S. M.	24	M	R	Fall	Negative	No defect
H. S.	58	F	L	Fall	Arthritis	No defect
H. S.	61	F	R	Unknown	Arthritis	Large defect
K. D.	26	M	L	Fall	Negative	Not taken
L. L.	20	M	L	Fight	Negative	Small defect
E. W.	23	M	R	Auto wreck	Negative	Not taken
C. S.	24	M	L	Fall	Negative	Small defect
R. B.	27	M	L	Fall	Negative	Not taken
J. F.	19	M	L	Football	Negative	Small defect
D. F.	19	M	R	Boxing	Negative	Not taken
P. B.	30	M	R	Fall	Negative	Small defect
J. M.	23	M	R	Football	Negative	No defect

TABLE II
FOLLOW-UP

Case	Months	Recurrence	Motion	Pain	Comment
S. M.	52	No	Normal	None	Able to perform on parallel bars
S. M.	40	No	Normal	None	
H. S.	52	No	Normal	None	Advised to have fusion
H. S.	19	No	Slight limit	None	of left shoulder elsewhere
K. D.	52	Yes	.....	.....	Severe fall 10 days after discharge
L. L.	51	Yes	.....	.....	Dislocation in accident
E. W.	23	No	Normal	None	Lost after 23 months
C. S.	34	No	Normal	None	Heavy duty
R. B.	22	No	Normal	Yes	Works as house painter
J. F.	16	No	Normal	None	Worked as lifeguard, boxes
D. F.	15	No	Normal	None	Operates a clothes pressing machine
P. B.	6	No	Normal	None	Follow-up not complete after 6 months
J. M.	11	No	Normal	None	Plays basketball

SUMMARY

1. No operation devised for the treatment of recurrent dislocation of the shoulder joint has been universally accepted.

2. The Glassman operation exhibits certain distinct advantages.

3. Thirteen such operations on eleven patients are presented with a preliminary follow-up. There were two recurrences, both following re-injury severe enough to dislocate the normal shoulder joint. One patient had persistent postoperative pain. All patients examined had normal range of motion.

4. This series of cases is too small and has been followed up for an insufficient length of time to give a fair evaluation of the Glassman operation; however, the authors believe that it holds promise and is worthy of continued use.

REFERENCES

1. ADAMS, J. C. Recurrent dislocation. *J. Bone & Joint Surg.*, 30: 26–38, 1948.
2. BANKART, A. S. B. The pathology and treatment of recurrent dislocation of the shoulder joint. *Brit. J. Surg.*, 23–29, 1938.
3. BOST, F. C. and INMAN, V. T. Pathologic changes in recurrent dislocation; Bankart operative procedure. *J. Bone & Joint Surg.*, 24: 595–613, 1942.
4. CAVE, E. F. and ROWE, C. R. Capsular repair for recurrent dislocation. *S. Clin. North America*, 27: 1289–1294, 1947.
5. CROSBY, E. H. Surgical procedure for repair of recurrent dislocation; Preliminary report. *J. Bone & Joint Surg.*, 28: 809–812, 1946.
6. DOWNING, F. H. Simplification of Bankart's capsulorrhaphy for recurrent dislocation. *J. Bone & Joint Surg.*, 28: 250–252, 1946.
7. EYRE-BROOK, A. L. Recurrent dislocation, lesions discovered in seventeen cases, surgery employed and intermediate report on results. *J. Bone & Joint Surg.*, 30: 37–46, 1948.
8. GALLIE, W. E. and LE MESURIER, A. B. Recurring dislocation (treatment by fascial repair of labrum). *J. Bone & Joint Surg.*, 30: 9–18, 1948.
9. GIANNESTRAS, N. J. Magnuson-Stack procedure for recurrent dislocations. *Surgery*, 23: 794–800, 1948.
10. GLASSMAN, J. A. An extra-articular operation for recurrent dislocation of the shoulder joint. *Surg., Gynec. & Obst.*, 74: 755, 1942.
11. HARK, F. W. Habitual dislocation; use of Bankart procedure. *Arch. Surg.*, 56: 522–527, 1948.
12. HENDERSON, M. S. Tenosuspension operation for recurrent or habitual dislocation. *S. Clin. North America*, 23: 927–945, 1943.
13. HENDERSON, M. S. Tenosuspension operation for habitual dislocation. *Proc. Staff Meet., Mayo Clin.*, 19: 510, 1944.

14. Henderson, M. S. Tenosuspension operation for recurrent or habitual dislocations of the shoulder. *S. Clin. North America*, 29: 997–1009, 1949.
15. Hill, H. A. and Sachs, M. D. The grooved defect of the humeral head, a frequently unrecognized complication of dislocations of the shoulder joint. *Radiology*, 35: 670, 1940.
16. Ilfeld, F. W. and Holder, H. G. Recurrent dislocation, combination procedure preliminary report. *J. Bone & Joint Surg.*, 25: 651–658, 1943.
17. Kunz, H. G. Nicola operation. *Mil. Surgeon*, 96: 429–432, 1945.
18. Magnuson, P. B. and Stack, J. K. Recurrent dislocation. *J. A. M. A.*, 123: 889–892, 1943.
19. Magnuson, P. B. Treatment of recurrent dislocation. *S. Clin. North America*, 25: 14–20, 1945.
20. Mangels, M. Jr. and Robinson, C. A. Modified Nicola operation for correcting recurring anterior dislocations. *South. M. J.*, 40: 784–786, 1947.
21. May, H. Nicola operation for posterior subacromial dislocation of the humerus. *J. Bone & Joint Surg.*, 25: 78–84, 1943.
22. Meyers, O. R. Experience with capsulorrhaphy for recurrent dislocation of shoulder. *J. Bone & Joint Surg.*, 28: 250–252, 1946.
23. Moseley, H. F. Use of metallic glenoid rim in recurrent dislocations. *Canad. M. A. J.*, 56: 320–321, 1947.
24. Nicola, T. Recurrent anterior dislocation of shoulder, a new operation. *J. Bone & Joint Surg.*, 11: 128, 1929.
25. Nicola, T. Anterior dislocation, role of articular capsule. *J. Bone & Joint Surg.*, 24: 614–616 1942.
26. Odgers, S. L. and Hark, F. W. Habitual dislocation. *Surg., Gynec. & Obst.*, 75: 229–234, 1942.
27. Orell, S. The surgical treatment of recurrent dislocation of shoulder joint. *Surg., Gynec. & Obst.*, 70: 945, 1940.
28. Osmond, C. H. Habitual dislocations; Putti-Platt operation. *J. Bone & Joint Surg.*, 30: 19–25, 1948.
29. Palmer I. and Widen, A. Bone block method for recurrent dislocation. *J. Bone & Joint Surg.*, 30: 53–58, 1948.
30. Raney, R. B. and Miller, O. L. Nicola operation for recurrent dislocation; review of twenty-six cases. *South. M. J.*, 35: 529–532, 1942.
31. Robertson, R. and Stark, W. Diagnosis and treatment of recurrent dislocations. *J. Bone & Joint Surg.*, 29: 797–800, 1947.
32. Speed, K. Recurrent anterior dislocation at the shoulder, operative cure by bone graft. *Surg., Gynec. & Obst.*, 44: 468–477, 1927.
33. Stanek, W. F. and Andre, H. C. Nicola procedure for recurrent dislocation; experiences at Station Hospital. *Mil. Surgeon*, 95: 402–405, 1944.
34. Wahl, S. Operative treatment for recurrent dislocation. *Ann. Surg.*, 115: 441–444, 1942.
35. Watson, J. R. Recurrent dislocation-superior approach causing only failure in fifty-two operations for repair of labrum and capsule. *J. Bone & Joint Surg.*, 30: 9–18, 1948.

FEMORAL HERNIA

WITH SPECIAL REFERENCE TO ITS COMPLICATIONS

DAMON B. PFEIFFER, M.D. AND FLETCHER D. SAIN, M.D.

Abington, Pennsylvania

STRANGULATED hernia is often referred to as a complication fraught with dangers and difficulties but few that cannot be overcome if the case is seen in reasonable time.

In order to obtain an understanding of the problem of strangulated femoral hernia we have made a comprehensive analysis of a series of consecutive admissions over a ten-year period according to the following plan. We shall first review briefly some of the phases of general interest of femoral hernia, namely, incidence, etiology, diagnosis and basic plan of repair.

During this ten-year period 100 cases of femoral hernia and 1,164 cases of indirect inguinal hernia were seen in the Pfeiffer Surgical Clinic. This is within the percentage relationship of the femoral to inguinal hernia reported in other series. This comparatively low incidence and the high rate of complications of an otherwise simple condition has made femoral hernia an ever live subject in surgical literature.

Femoral hernia may be congenital but is more often acquired as a result of weakness of the structures which normally close the femoral canal. The relatively rigid anatomic boundaries of this region are a factor in the frequency of strangulation. The roof of the femoral canal is formed by the inguinal ligament and falciform margin of the fascia lata anteriorly; posteriorly Cooper's ligament, the pectineal fascia and pectineus muscle; Gimbernat's or the lacunar ligament medially and posteriorly and laterally the femoral vein.

Senile atrophic changes, loss of fat in the femoral canal, increase in lower abdominal pressure and use of the inguinal ligament in repair of inguinal hernia producing an enlargement of the femoral canal have been mentioned by Mueller[1] as factors causing femoral hernia.

The diagnosis of femoral hernia usually is not difficult. A mass can be palpated lateral and inferior to the pubic spine. Conditions occur when the diagnosis is difficult and the index of suspicion must always be high in obscure, complete or partial bowel obstruction. Richter's type of hernia is sometimes missed and the knuckle of bowel becomes gangrenous contributing to the mortality in strangulated femoral hernia.

Dunphy[2] describes three important circumstances leading to erroneous diagnosis: (1) patient and physician unaware of hernia; (2) hernia of long-standing dismissed as possible cause of symptoms because there was no local pain or tenderness in the groin; (3) usual signs and symptoms of intestinal obstruction develop slowly in approximately one-third of the cases because the ileum or colon is involved low or incomplete circumference of the bowel is caught. These factors lead to vague gastrointestinal upsets often erroneously diagnosed as large bowel malignancy. It is therefore axiomatic that complicated femoral hernia should be suspected in any patient with vague and undiagnosed gastrointestinal complaints. Pain and vomiting are the most common symptoms associated with strangulation. They may be sudden in onset or occasionally chronic lasting for days or weeks. The distribution of pain is usually generalized over the abdomen and may or may not be referred to the groin.

It will be pointed out in this study that a very important factor in the complications of femoral hernia is the failure of the patient to seek treatment for a condition known before complications developed.

The treatment of femoral hernia has two principal surgical approaches. The repair is made from below the inguinal ligament through a simple incision over the femoral opening or from above the inguinal ligament approached through the inguinal or abdominal incision. It has been stated that over 100 variations in technic have been reported; but with the success of the basic principle of Bassini[5] described in 1893 of obliterating the canal by suturing its roof or the posterior margin of the inguinal ligament and the falciform margin of the fascia lata to its floor or the pectineus fascia with

interrupted sutures, many of these variations are surgical fancies and unnecessary. The inguinal approach of Lotheissen[3] described in 1898 closed the canal from above. The conjoined tendon is sutured to Cooper's ligament to produce a barrier before the femoral ring. Results

TABLE I

	No. of Operations	Deaths	Mortality (%)
Massachusetts Gen. Hospital, Boston Mass.			
Uncomplicated by obstruction and gangrene	160	0	0
Complicated by intestinal obstruction; bowel viable.	31	0	0
Complicated by intestinal obstruction and gangrene.	20	10	50
Pfeiffer Surgical Clinic, Abington, Pa.			
Uncomplicated by obstruction and gangrene	65	0	0
Complicated by intestinal obstruction; bowel viable.	23	0	0
Complicated by intestinal obstruction, gangrene and intestinal anastomosis	12	3	25

are reported for this and other technics.[4] It will be pointed out that in this series the Bassini plan was preferred, being used in over 80 per cent of cases. The inguinal or abdominal closure was made when the abdomen had to be opened for other reasons or when the surgeon preferred this plan. The objection to the inguinal approach is that it may weaken the floor of the canal and predispose to a direct hernia.

The record of treatment of uncomplicated femoral hernia has been a brilliant one since 1893 when Bassini described the plan of transfixion and high ligation of the neck of the sac with obliteration of the femoral canal by uniting the roof of the canal with the pectineus fascia. Up until this time the only treatment of femoral hernia had been excision and closure of the sac with a large percentage of recurrence. In 1893 Bassini[5] reported fifty-four cases, of which forty-one were traced several years postoperatively with not a single recurrence found. DeGarmo[6] in 1905 reported 110 operations for femoral hernia with but one recurrence. Over the past fifty years many comparable reports have been made. In 1948 Mueller[1] reported a series of twenty-five cases with no recurrence. Recurrences are reported but the significant fact here is that large series of femoral hernias are treated with minimal recurrence rates and no mortality, regardless of age, in the uncomplicated cases. On the other hand, femoral her-

TABLE II

Author	Year	No. of Cases Gangrenous Bowel	Deaths	Mortality (%)
Gibson	1900	354	120	34
Becker	1922	24	6	25
Springer	1924	16	9	56
Frankau	1931	116	40	34
McIver	1933	8	4	50
Bowers	1935	5	4	80
Dunphy	1940	20	10	50
McNealy	1942	33	20	60
Adelaide	1943	12	8	66
Hay	1943	6	6	100
Pfeiffer and Sain	1951	12	3	25

nia complicated by gangrene of the intestine has a very high mortality rate ranging from 25 to 100 per cent in many reported series of cases. (Table I.)

In the face of a fifty-year record of poor results without significant improvement in the last category of complicated gangrenous hernia when compared with consistently good results in uncomplicated femoral hernia it is regrettable that all these patients cannot undergo hernioplasty early. (Table II.)

Of 100 consecutive admissions to the Abington Memorial Hospital with femoral hernia eighty-two patients had known this condition existed for a period of a few days to fifty-five years, yet seventy-seven of these had to be driven to seek treatment because the hernia would not go back. Twelve of these had progressed to the state of gangrene requiring intestinal anastomosis representing the highly fatal phase of femoral hernia.

The 100 admissions for femoral hernia up to 1950, covering a ten-year period, are analyzed according to a ten-phase plan of study. The findings from this plan of study are very revealing. Femoral hernia is important, particularly from the viewpoint of pitfalls in diagnosis, patient inertia and the consequent necessity of

the family physician and surgeon recommending treatment in all cases as soon as diagnosed. It is important, also, because of its relationship to other phases of surgery and the medical profession in general, namely, the problem of intestinal obstruction and gangrene, the widely discussed diagnostic clinic, medical survey, radio and television health programs on a national scale.

The ten phases of the 100 consecutive cases admitted for femoral hernia revealed: (1) age of patient, one month to ninety-two years; (2) sex, females sixty-six and males thirty-four; (3) known by patient (few days to many years), eighty-two patients; (4) irreducible preoperatively, seventy-seven patients; (5) diagnosed by family physician, ninety-three patients; (6) diagnosed preoperatively (as femoral or inguinal), ninety-eight patients; (7) contents—small bowel twenty-eight (dark viability returned sixteen, gangrene twelve), omentum thirty-six, omentum and small bowel seven (included in small bowel), large bowel five, tube and ovary one, appendix one, Meckel's diverticulum (previously reported) one, urinary bladder one, sac empty seventeen; (8) spontaneous reduction under anesthesia fourteen; abdomen opened in two of these, bowel found viable; others recovered uneventfully; (9) procedure—high ligation of sac, closure of femoral canal, wire preferred eighty-six, closed through abdomen fourteen; (10) anesthesia—spinal sixty-nine, general twenty, local seven, local and general four.

AGE DISTRIBUTION

1–20	4
21–30	4
31–40	14
41–50	24
51–60	19
61–70	18
71–80	12
81–90	4
91–100	1

The youngest patient in this series was a little girl one month of age who had the right tube and ovary incarcerated for ten days before operation. The oldest patient was a ninety-two year old female who had 20 cm. of discolored bowel in her hernia. It had been irreducible for only three hours. Both of these patients had uneventful convalescence. There were patients in all age groups with the majority coming in the middle decades. According to our records the age of the patient was not a significant factor in the recovery except in the group complicated by gangrene of the intestine. The three deaths occurred in this latter group in patients aged seventy-seven, seventy-nine and eighty-one, respectively. Table III shows the ages and summary of the group of twelve requiring intestinal anastomosis.

TABLE III

Age	Sex	No. of Chart	Known by Patient	Result
45	F	2571	Many yr.	Good
65	M	19214	55 yr.	Good
81	F	10161	5 yr.	Good
65	F	11136	Not mentioned	Good
79	M	15279	Few months	Death
74	F	6067	Two months	Good
81	F	20376	Unknown	Death
74	F	7503	Four months	Good
63	F	23003	Two days	Good
46	F	26015	Unknown (symptoms of obstructions 1 day)	Good
77	F	9217	Not mentioned (symptoms of obstruction 1 day)	Death
59	F	4523	Unknown (not diagnosed preoperatively) operated for bowel obstruction; 1 day duration	Good

The seventy-nine year old man who died had been sick for one day with symptoms of bowel obstruction. At operation the small bowel was distended and fissured; gangrenous knuckle of bowel was inverted and side-to-side anastomosis made. Autopsy showed the small bowel perforated 90 cm. proximal to the anastomosis which had held without leaking.

The eighty-one year old female who died represents one of the pitfalls in diagnosis of femoral hernia which is mentioned in many reports on this subject. Dunphy reporting from the Peter Bent Brigham Hospital in Boston, emphasizes this point. This patient was sick and under care of her doctor for nine days before coming to the Hospital. She was complaining of abdominal discomfort, flatulence and nausea becoming progressively worse, to colic and vomiting. She was admitted to the Hospital with a diagnosis of partial intestinal obstruction, etiology probably malignancy, a common error when femoral hernia diagnosis is missed. Five days after admission, diagnosis was made when a mass appeared in the groin. The fact that the patient continued to move her bowels and pass flatus until the day before diagnosis

was made confused the issue greatly. At operation the mass was found to be an abscess from a gangrenous knuckle of sigmoid colon caught in the left femoral canal. The gangrenous knuckle of bowel was excised leaving viable colon on the mesenteric side. A No. 36 T tube was fastened into the sigmoid and the abscess cavity was drained. The patient improved and a colostomy was established. About the fifth postoperative day a fecal vesical fistula developed and she died the tenth postoperative day from sepsis.

The third death occurred in a seventy-seven year old woman who had had symptoms of bowel obstruction for one day. At operation the gangrenous bowel was resected, and an end-to-end anastomosis was made. Her general condition was very poor and she died the second postoperative day. No autopsy was obtained.

One patient in this group with gangrene of the bowel illustrates the pitfalls in the prognosis of a patient with femoral hernia. A sixty-five year old male (19214) had his hernia for fifty-five years and it had been irreducible for many years. There are many such patients who are told by their doctors to forget it. This patient pushed a knuckle of small bowel behind the omentum which had plugged the femoral canal for many years. The omentum was firmly adherent and the small bowel behind it was gangrenous. There are many such cases to illustrate that this highly lethal potential is ever present in femoral hernia and that patients should all be operated upon as soon as the condition is diagnosed. Furthermore, public health education should urge the laity to seek surgical repair of all hernias as soon as discovered since hernia is a leading cause of bowel obstruction, a highly fatal condition.

The ninety-three cases diagnosed correctly by the family physician include all cases in which diagnosis of hernia was made. A few of these were diagnosed as inguinal hernia and a few as "inguinal or femoral." The ninety-eight diagnosed preoperatively also include the few cases in which a differential could not be made with certainty between femoral and inguinal hernia before operation. Occasionally a mass is found lying over the inguinal region and its hernial orifice cannot be determined with certainty until operation is performed. However, this in no way deters action for correction. Of the two cases missed one was disgnosed preoperatively as small bowel obstruction, and at abdominal exploration the undiagnosed knuckle of a small bowel was found strangulated in the femoral ring requiring intestinal anastomosis. The other undiagnosed case was uncomplicated and found incidental to an operation for an indirect inguinal hernia.

Contents of the sac revealed omentum alone in thirty-six patients and small bowel in twenty-eight, of which seven contained omentum along with the small bowel. In twelve patients the intestine was devitalized requiring bowel surgery. In six of these twelve patients the gangrenous knuckle of bowel was inverted by silk mattress sutures. It is believed that this method of handling the gangrenous bowel is less shocking to these senile, poor risk patients than resection and anastomosis. This simple inversion of the devitalized bowel should be performed in the Richter's type of hernia or in the cases in which the area of gangrene does not completely encircle the bowel and the involvement of the mesentery is minimal in this region. It is suggested that this simplified plan is a factor in the relatively low mortality in this group of complicated cases.

In sixteen of the twenty-eight cases in which small bowel was found in the sac the intestine was darkened and discolored indicating impaired circulation, but vitality returned. In all questionable cases the bowel was either wrapped in warm, moist gauze packs or returned to the abdomen for a minimum of ten minutes by the clock. Muscle stimulation by gentle pinching or flicking with the finger is important to determine bowel viability. This maneuver will elicit muscle contraction in the viable bowel. Five times the large bowel was found in the sac and seventeen times it was found to be empty. The following organs were found once: tube and ovary, appendix, Meckel's diverticulum and the urinary bladder.

In fourteen patients the irreducible hernia reduced spontaneously under anesthesia. Only twice was it thought necessary to open the abdomen to determine viability. In both of these patients the bowel was found viable. All of this group made uneventful convalescence.

The procedure preferred in the majority of femoral hernioplasties in the Pfeiffer Surgical Clinic is high ligation of the sac with transfixion and closure of the femoral canal by suturing the inguinal and Gimbernat's ligaments to the pectineus muscle. Mattress No. 32 to 28 wire sutures were used in 86 per cent of these

100 patients. In 14 per cent the hernioplasty was performed from the abdominal side using the McVey technic or a modification of it. It was necessary to enlarge the femoral ring fourteen times. This was done with the herniotome by the stepcut plan upward and inward to facilitate an easier closure of the ring. There should be no hesitancy in cutting the femoral ring when the hernia is not readily reducible. The cut should be upward and inward away from bowel and vessels.

Spinal anesthesia was used in sixty-nine patients, general anesthesia in twenty, local in seven and local with general four times. The general anesthesia was sodium pentothal or ether, or a combination of sodium pentothal, gas and ether.

COMMENTS

It is significant that 82 per cent of these patients had known of their hernia previous to hospitalization. The vast majority of these 82 per cent had known of it for a period of several months to many years. The fact that 77 per cent waited until the hernia became irreducible indicates that the laity and the medical profession should be better informed regarding the high mortality of complicated femoral hernia as compared to the absent or low mortality associated with the operation for simple femoral hernia, with mortality ranging from 25 to 100 per cent in reported series of cases of the all too frequent complication of devitalized intestine requiring anastomosis, a complication which is nearly always preventable. It is suggested that the now commonly used press, radio and television for transmitting information to the public should come to the aid of this poorly understood subject. Just recently WGN-TV Chicago received a gold medal award by popular vote for its service of disseminating public health information.

There are important phases of a subject which are not revealed in a statistical analysis. Statistics may be misleading, but valuable general knowledge can be gained from such a study when the student is aware that despite statistical indications he must recognize the necessity of individualization tempered with generalization. This point is specifically illustrated by an individual case management which left a lasting impression since the days of my internship. A white, middle-aged male with vague abdominal pain and nausea was referred without a definite diagnosis to the surgical ward of Abington Memorial Hospital by a thoroughly competent family physician. Past history revealed nothing more than recent persistent abdominal pain and nausea. Physical examination was essentially negative. Surgical intervention by one of the authors (D. B. P.), motivated by experience, surgical judgment, consideration and knowledge of the pitfalls in the diagnosis and management of this type of case, led to the confirmed diagnosis and early cure of a strangulated femoral hernia of the Richter type.

Sixty-four cases were followed up two to nine years postoperatively. Two recurrences were found, a rate of 3 per cent. One of these recurrences was in a patient who had had numerous injection treatments for femoral hernia; the other had been repaired through the superior approach. Both of these patients were reoperated upon and followed up over five years showing no evidence of recurrence.

SUMMARY

1. One hundred cases of femoral hernia have been analyzed.

2. Seventy-seven per cent sought treatment because of irreducible hernia.

3. Twelve per cent progressed to a complication requiring anastomosis in this series with a 25 per cent mortality.

4. Simple inversion of gangrenous bowel and anastomosis is recommended in preference to resection and anastomosis when devitalization is not extensive as is frequently the case in complicated femoral hernia.

5. The modified Bassini technic was the procedure for hernioplasty used in 86 per cent of this series.

6. Public health education on hernia is suggested.

7. Follow-up recurrence rates are reported.

REFERENCES

1. Mueller, R. F. Femoral hernia. *Arch. Surg.*, 56: 229–237, 1948.
2. Dunphy, J. E. Diagnosis and surgical management of strangulated femoral hernia. *J. A. M. A.*, 114: 394, 1940.
3. Lotheissen, G. Zur Radikaloperation der Schenkelhernien. *Central. f. Chir.*, 25: 548–550, 1898.
4. Lindah, O. Surgical therapy of crural hernia with special consideration of frequency of recurrences. *Nord. med.*, 30: 1220–1222, 1946.
5. Bassini, E. Mono Metodo Operation per la Cura Radicale dell'Ernia Crurale. Padova, 1893. A. Draghi.

6. De Garmo, W. B. Cure of femoral hernia; result of 110 operations by a single method. *Ann. Surg.*, 42: 209–214, 1905.
7. Frankan, C. Strangulated hernia. *Brit. J. Surg.*, 19: 176, 1931.
8. Gatch, W. D. and Montgomery, W. F. Treatment of external hernias containing gangrenous bowel. *J. A. M. A.*, 129: 736–739, 1945.
9. Bhajekar, M. V. Strangulated hernia. *Arch. Surg.*, 54: 41–47, 1947.
10. Park, W. D. Treatment and after treatment of strangulated hernia. *M. Press*, 217: 89–91, 1947.
11. Jones, T. E. and Kehm, R. W. Obscure incarcerated or strangulated hernia as cause of intestinal obstruction. *Cleveland Clin. Quart.*, 13: 9–10, 1946.
12. Coley, W. B. Radical cure of femoral hernia. *Tr. Am. S. A.*, 24: 402, 1906.
13. Jens, J. Strangulated femoral hernia—review of 100 cases. *Lancet*, 1: 705–707, 1943.
14. Harkins, H. N. and Smensan, S. A. Cooper's ligament herniotomy. *S. Clin. North America*, 23: 1279–1297, 1943.
15. McVey, C. B. Inguinal and femoral hernioplasty: anatomic repair. *Arch. Surg.*, 57: 524–530, 1948.
16. Rice, C. O. and Strickler, J. H. Repair of hernia with special application of principle evolved by Bassini, McArthur and McVey. *Surg., Gynec. & Obst.*, 86: 169–176, 1948.
17. Patterson, F. M. S. Incarceration of Meckel's diverticulum in a femoral hernia. *North Carolina M. J.*, 7: 59–60, 1946.

According to various statistical studies, from 3 to 20 per cent of women with uncomplicated uterine retroversion are sterile. When endocervicitis, uterine fixation and adnexitis are also present, the incidence of sterility increases greatly and these require adequate surgery. Before resorting to therapy for sterility due to uncomplicated retroversion, the surgeon should make sure oligospermia or azoospermia is not also present. If not some form of ligamentopexy is justified and is followed by the desired pregnancy in about one-half of the cases; many, however, remain sterile after surgery, probably because other factors are also present even though unrecognized. Surgery is rarely successful in patients with advanced pelvic disease such as tubal pathology. (*Richard A. Leonardo, M.D.*)

ACUTE APPENDICITIS IN CHRONICALLY ILL GERIATRIC PATIENTS*

LOUIS CARP, M.D., AND JOSEPH A. ARMINIO, M.D.
New York, New York

ACUTE appendicitis has a low incidence among the elderly. For example, Taylor[1] found that among 1,000 consecutive patients with this disease who were admitted to the large general London Hospital, 1.5 per cent were sixty and over. The cases stressed here come from the 1,800 bed municipal Goldwater Memorial Hospital, which is designed primarily for patients with chronic or prolonged illness. Most of them are in the older age groups and include those who are extreme substandard surgical risks[2–5] and have multiple degenerative diseases frequently complicated by malnutrition and personality changes. Emphasis will be placed on the clinical and operative findings, diagnostic problems, pathology and results of therapy in twenty-one chronically ill patients sixty years and over who developed acute appendicitis. In recent years the concepts for the therapy of this disease in geriatric patients have varied among different writers. We shall propose methods of management which conform to basic surgical principle in the hope that the high mortality rate will be lowered.

CLINICAL SYNDROME AND DIAGNOSIS

Our cases cover the period between July, 1939 and July, 1951. We have been impressed by the long time interval between the onset of symptoms and professional advice and therapy, by the diagnostic problems and by the high mortality rate of 23.8 per cent. Thirteen of our patients were male. The youngest of all the patients was sixty, and the oldest ninety. The average age was sixty-eight. In nineteen of the twenty-one cases the differential diagnosis was difficult. The main reasons were:

1. A clinical syndrome which might have been produced by obstruction, inflammation, new growths, calculous formation or vascular accidents in abdominal organs other than the appendix, especially in the intestinal, genital, urinary or gallbladder tracts.

2. Lower abdominal symptoms from chronic intestinal stasis or bladder retention, both of which are so common in the type of patient under discussion.

3. Relative infrequency of the condition in the aged, which might have caused the physician to overlook the correct diagnosis.

4. Underlying degenerative diseases for which the patients were originally admitted and which added to confusion. These diseases included arteriosclerosis, hypertension, cardiac valvular disease, coronary artery disease and myocarditis, asthma, chronic bronchitis and emphysema, Paget's disease, prostatic hypertrophy, vitamin deficiency, osteoarthritis, dorsal lateral sclerosis, paralysis agitans, Huntington's chorea, diabetes mellitus, peripheral vascular disease and syphilis.

5. Difficult evaluation of the pain, one of the first symptoms of appendicitis, unless the patient could give an accurate description of its time intensity, localization or radiation. It is understandable that such details may easily escape the attention of the average patient. This is especially true in geriatric patients in whom the pain sense is dulled, who tend to be casual and stubborn about illness, who seek relief with remedies of their own or who are subject to memory defects, mental rigidity or mental distortion.

Two patients in whom appendicitis was found had an incorrect preoperative diagnosis of ruptured peptic ulcer and intestinal obstruction, respectively. Six patients had an incorrect preoperative diagnosis of acute appendicitis. The postoperative findings in these six patients were fibrotic appendicitis, acidosis, acute cholecystitis, carcinoma of the cecum, calculous pyonephrosis and no pathologic disorder. These difficulties in diagnosis coincide with the experiences of practically all writers on the subject.[6–11] Stalker[12] reports atypical histories in thirty of fifty-one cases. Wood[13] found that the

* From the Second Surgical Division and the Department of Pathology, Goldwater Memorial Hospital, New York, N. Y. Read before the Second International Gerontological Congress, September 9–14, 1951, St. Louis, Mo.

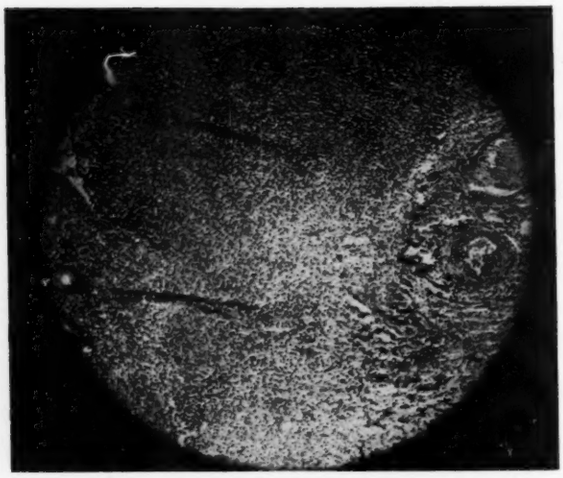


FIG. 1. Photomicrograph of acute appendicitis in a sixty-three year old man who had hemiplegia. There is diffuse infiltration of the mucosa and submucosa with polymorphonuclear leukocytes. Two sclerotic medium-sized arteries are seen in the submucosa at right of section. The lymphoid tissue is markedly decreased and no follicles are seen. × 55.

diagnosis was missed in 38 per cent of his forty-three cases. If the classical textbook picture is relied upon, especially in old people, diagnostic errors and mistakes in judgment will be inevitable. An unreliable or atypical history and atypical physical signs may procrastinate surgical intervention.

As a rule, the onset is not acute but rather insidious. There may be vague mild abdominal cramps or discomfort which the patient disregards and which may continue for several days or longer. In our series the average time between the beginning of symptoms and operation was three and a half days; the minimum time was twelve hours and the maximum one week. The pain may eventually localize in the right lower quadrant. There is usually nausea but no vomiting. Constitutional disturbance is not marked. There may be little rise in pulse or fever. In six of our patients the temperature was normal. Constipation is the rule, the tongue is dry and coated and the breath foul. Three signs are almost constant: tenderness over McBurney's point, rebound tenderness and marked abdominal distention. This may confuse the picture to such an extent that it simulates intestinal obstruction. A mass may be palpable. The low degree of abdominal rigidity, pulse rapidity, fever and leukocytosis is usually not indicative of the pathologic severity. Rectal examination may or may not be helpful. A flat abdominal film should be routine. It will show distended intestinal loops and may serve to rule out renal or gallbladder calculi. A chest film should exclude pneumonia and a urinalysis should exclude pyelitis.

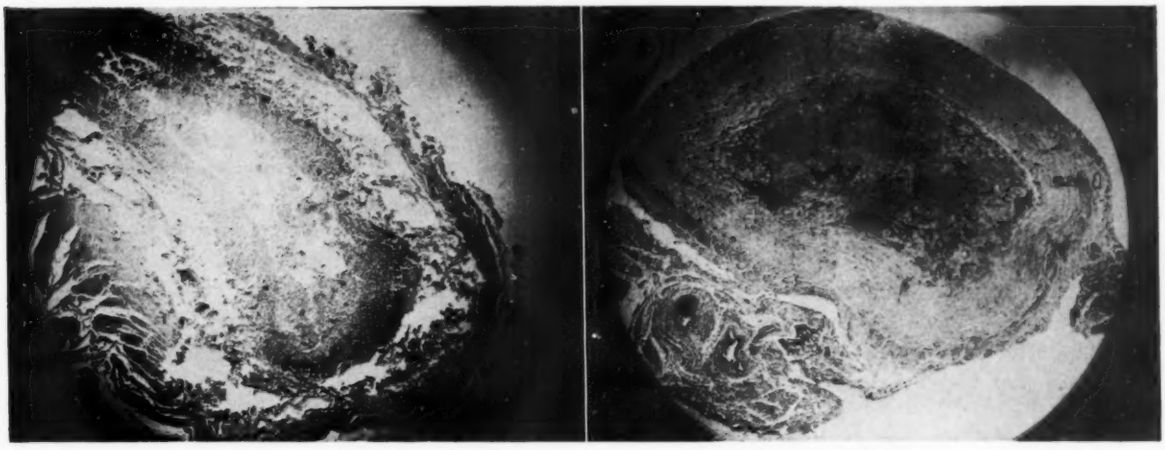
Several authors[6, 14, 15] have noted that acute appendicitis is more severe in the Negro than in the white patient. This is explained by the long time interval before medical advice and by the greater incidence of catharsis.

PATHOLOGY

The cases included eleven patients with nonperforated appendices and ten with perforations. In the latter there were abscesses in five and general peritonitis in five. The tissues were edematous, the appendix swollen and gangrenous, the mesentery friable and its vessels thrombosed or so sclerotic that bleeding was difficult to control in several instances. There was little tendency to the formation of fibrinous exudate so that spread of infection became easier. Taylor[1] has given a summary of some of the operative findings in the 110 cases he reports. "Cases seen on the first day had a little clear fluid only; by the second day the fluid was purulent, being shut off by adhesions in half the cases, but diffusing over the abdomen in the others. On the third day there was diffuse peritonitis in two-thirds of the cases, and abscess formation in one-third, while all the patients who lived to the fourth day and after had an abscess."

A review of sixteen available microscopic sections in our series of patients with or without perforation suggested that the lymphoid tissue was generally diminished as compared with younger age groups and that there were no striking differences in the mucosal glands. (Fig. 1.) The muscularis and mucosa showed varying degrees of infiltration, depending on the severity of the inflammatory process. Approximately half the patients had acute diffuse gangrene. Moderate to marked sclerosis of the blood vessels was noted in a little over half the sections. In the remainder the sclerosis was slight. There was evidence of previous inflammatory changes in one or more layers of the appendix in about half the patients.

Another study was made of thirteen appendices removed at autopsy in patients between the ages of sixty-one and eighty-six who died of causes other than appendicitis. Sections



2A 2B

FIG. 2. Photomicrograph of one of non-inflammatory appendices removed at autopsy. The patient was a sixty-eight year old man who died of hypernephroma with liver metastases, arteriosclerosis and pericarditis. The sections are through the (A) proximal and (B) distal portions of the appendix. The lymphoid tissue and glands are markedly decreased and sclerotic blood vessels are seen.

were made at the proximal, middle and distal ends of these appendices for histologic examination in order to determine the status of the lymphoid follicles and any changes in the walls of the blood vessels. An analysis of the microscopic findings showed that the lymphoid follicles were markedly decreased or absent, especially at the middle and distal ends of the appendices. (Fig. 2.) The blood vessels were moderately or markedly sclerotic, the muscularis was atrophic and the mucosal glands decreased. This study, as it relates to the lymphoid follicles, substantiates the work of Bernardo-Comel[16] and Stefanelli.[17] Miangolarra[18] has discussed diminished local resistance in appendices of the aged because of the scarcity or absence of lymphoid follicles.

The foregoing observations seem to indicate that the following are some of the factors that contribute to the severity of the pathologic process: (1) The comparative lack of lymphoid follicles in the wall of the appendix so that there is diminished local resistance to infection; (2) arteriosclerosis of the blood vessels which supply the appendix so that ischemia makes it more vulnerable to gangrene and (3) the presence of fecoliths, foreign bodies or fibrous tissue strictures resulting from previous inflammation, all of which produce obstruction in the appendix. Additional contributing factors are: (1) A long time interval before operative therapy; (2) catharsis; (3) accompanying degenerative disease and (4) disturbance in normal chemical balance.

THERAPY

Appendectomy was performed on all eleven of our non-perforated patients, with no mortality. In the remaining ten patients there were five with abscess. In two of these drainage alone was done. They survived and did not require any further operative therapy. The other five patients had peritonitis, with appendectomy and drainage.

Stalker[12] records that in fifty-one patients sixty years and over who had perforation, simple drainage was performed in twenty. Eight of these subsequently required appendectomy. In the series of cases reported by Tashiro and Zinninger[6] in all age groups, thirty-two patients did not have appendectomy in the presence of abscess because the appendix was in or beyond the confines of a well walled-off abscess. Six of these patients were readmitted for appendectomy for interval appendicitis and another for acute appendicitis with perforation and general peritonitis.

These records point to the advisability of operative intervention with appendectomy in all cases as soon as the patient has been adequately prepared, unless it is found at operation that technical difficulty would prolong the operative time to such an extent that the hazard to life would be markedly increased or that the additional trauma would be instrumental in further spread of infection. Drainage alone is then indicated. These principles have been forcibly supported by Tashiro and Zin-

ninger,[6] Garlock[19] and Schullinger,[20] and in an editorial article by Boyce.[21] All our patients with abscess or peritonitis were drained.

Some writers have not followed this basic therapeutic principle. They claim that their results justify complete closure of the peritoneum, especially since chemotherapy and antibiotic therapy have been available. Stalker[12] reports non-operative therapy in five of fifty-one patients with rupture. Two of the five died. Taylor[1] in 1935 strongly advised drainage to the appendix site without appendectomy and non-operative therapy for those patients with abscess.

We cannot endorse these types of management as a routine. We used the McBurney incision in fourteen cases and the right rectus or paramedian incision in seven cases. It is generally agreed[1,6,8,11,12,22–27] that if the diagnosis has been established with reasonable certainty, it is preferable by far to use the McBurney incision in all age groups. Operative trauma is less, drainage is more direct, obstruction, wound infection and postoperative hernia are diminished and operative mortality is lower. We used a right rectus incision when the clinical diagnosis was confusing enough to warrant the probability of exploration.

Mueller[22] and Collins[8] have advised sulfonamide therapy locally. Strohl et al.[25] reported little evidence that such therapy had any effect in reducing mortality. Gross contamination of the wound at the time of operation makes it advisable to leave it open either above the peritoneum or the fascia. Gastrointestinal tube decompression, routine supportive and antibiotic therapy and early ambulation are indicated.

CAUSES AND POSSIBLE REDUCTION OF MORTALITY

The grouping of all patients above the ages of forty or fifty does not give a true statistical picture. It has been shown[2] that mortality after operation on geriatric patients increases in proportion to the advance in decades. Table I gives our mortality statistics and includes those from other sources in which the risks are probably not as bad. We have not included in our statistics the mortalities in four patients who died from unrelated causes long enough after operation to justify their exclusion as mortalities. One of them died in six months from cerebral hemorrhage; another after twenty-one months from a pulmonary infarct secondary to a cardiac mural thrombus; the third after four years from lymphatic leukemia; the last after six years from bronchopneumonia. It will be noted that the death rates in the foregoing table are high enough to stimulate serious consideration of their causes and to formulate methods to lower them.

The outstanding contributing factors to mortality in acute appendicitis are (1) delay in operation and catharsis and (2) accompanying degenerative disease. Delay in operation and catharsis predispose to perforation. Barrow[28] reports that in patients sixty and over perforation had been found to exist in 77.2 per cent of the cases and Stalker[12] found the same in 62 per cent. Statistics show[6,7] that in all age groups, especially in the elderly, perforation will increase mortality. Reference to Table II will show that the longer the time interval before operation, the more serious was the patient's condition and the higher the mortality rate. Wood[13] also demonstrated this. Only one of our patients gave a history of catharsis. This is explained by the fact that most of our patients were in residence on other services in the hospital or in a municipal home for the indigent where medical observation was available. It is generally conceded that catharsis will precipitate more serious disturbance in the appendix. This has been shown statistically.[6]

Accompanying degenerative disease produces conditions such as pathologic disorders of the heart, lungs and kidneys, arteriosclerosis and hypertension, poor liver function, metabolic diseases of long-standing, neurologic disorders and disturbed chemical balance. All our patients had degenerative diseases. They have been mentioned previously. Fourteen patients were in the seventh, five in the eighth, one in the ninth and one in the tenth decades. Two patients in the seventh decade and both patients in the ninth and tenth decades died. The causes of death in two of our autopsies are given in Table III together with the autopsy findings of others and the mortality statistics of Stalker.[12] Powers[11] states that death among the aged after acute appendicitis is frequently due to the hazards of surgery resulting in pulmonary and cardiovascular complications and cerebral accidents. Boyce[9] includes complications such as mesenteric thrombosis, pylephlebitis and liver abscess. Thieme[7] stresses peritonitis, ileus and undrained abscesses as causes of death, and Strohl et al.[25] list peritonitis and

TABLE 1

SELECTED MORTALITY STATISTICS IN ACUTE APPENDICITIS*

Source	Age 60 and Over				All Ages	
	Age Groups and Diagnosis		Patients	Mortality (%)	Patients	Mortality (%)
Carp and Arminio 1939–1951	60–69	Acute appendicitis	9			
		Acute appendicitis with abscess	2	50		
		Acute appendicitis with general peritonitis	3	33.3		
	70–79	Acute appendicitis	2			
		Acute appendicitis with abscess	2			23.8
		Acute appendicitis with general peritonitis	1			
	81	Acute appendicitis with general peritonitis	1	100		
	90	Acute appendicitis with abscess	1	100		
Strohl et al.,[25] up to 1947	60–70	Acute appendicitis	9			
		Acute appendicitis with abscess	7			
		Acute appendicitis with peritonitis	6			
	70–80	Acute appendicitis	8	13	2.5	878	1.48
		Acute appendicitis with abscess	4			
		Acute appendicitis with peritonitis	6			
Thieme[7] 1936–1944	60–69		31	12		
	70–79		5	80	28	1,042	2.1
	80		1	100		
Jennings et al.,[31] up to 1942	61–70		14	15		1,680	1.9
Green et al.[30] 1930–1941	60–64		300	19		
	65–69		154	29	25.3	19,399	4.7
	70		136	36		
Boyce[9] 1930–1939	60–70		41	17		
	70–80		18	18	16	4,207	5.6
	80–90		2			
Stalker[12] 1924–1938	60–70		70	15.9			
	70–80		12				
Ray[26] 1932–1937	61–70		7	28.5	44.5	886	2.1
	70+		2	100		
Maes, McFetridge[15] 1930–1935	80+		9	44.4		2,295	5.7
Goldsmith,[32] up to 1931	69–9		8				
	70–79		5	42			
	80		1				
Wood[13] 1913–1934	60+	Acute appendicitis	7	14			
		Acute appendicitis with local peritonitis	8	25			
		Acute appendicitis with general peritonitis	4	75	27		
		Acute appendicitis with abscess	24	25			
Fitch,[29] up to 1928	60–70		11	54.5	54		
	70+		2	50			

* The years covering the statistics are indicated in order to give an approximate idea of the relationship of these statistics to the advent of chemotherapy (1940) and antibiotic therapy (1946).

TABLE II

CORRELATION OF PREOPERATIVE DELAY WITH OPERATIVE FINDINGS AND RESULTS IN TWENTY-ONE CASES*

History in Days before Operation	No. of Patients	Operative Findings	Result	Cause of Death
1	10	Acute appendicitis	Survived—10	
	3	Acute appendicitis General peritonitis	Survived—2 Died—1	General peritonitis; bronchopneumonia 1 day postoperatively (autopsy)
2	3	Acute appendicitis Abscess	Survived—2 Died—1	Cardiac failure 1 day postoperatively
3	1	Acute appendicitis General peritonitis	Died	General peritonitis; cardiac failure 1 day postoperatively (autopsy)
4	1	Acute appendicitis Abscess	Died	Bronchopneumonia 10 days postoperatively
5	1	Acute appendicitis Abscess	Survived	
7	1	Acute appendicitis	Survived	
?	1	Acute appendicitis Abscess	Survived	

* The appendix was removed in all cases except in 2 of the 6 patients who had abscess; both of these patients survived.

TABLE III

CAUSES OF DEATH ACCORDING TO AUTOPSY FINDINGS

Authors	No. of Cases	Age	Operative Findings	Cause of Death
Carp and Arminio	1	81	Acute appendicitis; general peritonitis (appendectomy, drainage)	General peritonitis; bronchopneumonia; cardiac failure (1 day postoperatively)
	1	63	Acute appendicitis; general peritonitis (appendectomy, drainage)	General peritonitis (1 day postoperatively)
Ray[24]	1	61	Gangrenous appendicitis; spreading peritonitis (drainage without appendectomy)	General peritonitis; pneumonia; thrombosis pulmonary artery (10 days postoperatively)
	1	75	Gangrenous appendicitis; spreading peritonitis (appendectomy, drainage)	General peritonitis (3 days postoperatively)
	1	83	Gangrenous appendicitis (appendectomy)	Ileocecal abscess; thrombosis pulmonary artery (22 days postoperatively)
	1	62	Gangrenous appendicitis; spreading peritonitis (drainage without appendectomy)	General peritonitis; extensive atelectasis; diabetes (3 days postoperatively)
Strohl et al.[25]	1	80	Acute appendicitis (appendectomy)	Pulmonary embolus (4 days postoperatively)
			Causes of Death (Autopsy Not Indicated)	
Stalker[12]	9		Acute appendicitis; perforation (2 patients not operated upon)	General peritonitis, 8; pneumonia, 1
	4		Acute appendicitis	Pneumonia, 2; cardiac failure, 1; embolism, 1

ileus. It is apparent from most of the above observations that peritonitis is the major cause of death.

A consideration of the facts that have been presented indicates the following methods of reducing mortality: (1) Early diagnosis through better education of the public and the physician; (2) quick operative intervention after prompt supportive therapy, with appendectomy as a routine, unless technical difficulties or the danger of spread of infection from added trauma would add to the threat of mortality. It is preferable to tie off the appendix at its base, amputate it and phenolize the stump without its inversion when time and a cecum which is too edematous and friable are factors; (3) drainage of patients with peritonitis or those with abscess; (4) use of the McBurney incision, unless an exploratory celiotomy is indicated in cases in which the diagnosis is doubtful; (5) interdiction of abdominal closure above the peritoneum or the fascia if gross contamination of the wound has occurred; (6) a carefully chosen and expertly administered anesthetic; (7) use of the newer supportive and antibiotic therapy and (8) early ambulation whenever possible.

There can be no question that the use of sulfonamide and antibiotic therapy has reduced mortality. However, this therapy is not all powerful and it is far safer to consider it supplemental rather than substitutional. Due credit must also be given to scientific advances in preoperative and postoperative treatment, to better anesthesia, blood transfusion, maintenance of adequate chemical balance, gastrointestinal tube decompression and better use of the old and newer drugs.

SUMMARY

Twenty-one chronically ill substandard risk patients between the ages of sixty and ninety who had acute appendicitis with or without abscess or peritonitis are discussed. They cover a period between 1939 and 1951. The disease is infrequent in geriatric patients and usually serious. Atypical clinical syndromes, difficulty in diagnosis, delayed operation, catharsis and accompanying degenerative disease all contribute to a high mortality. Our mortality rate is 23.8 per cent. Mortality statistics from other sources are also high. Peritonitis, pneumonia, cardiac failure and thrombosis have been among the leading causes of death in several autopsies. Suggestions are made to help reduce mortalities.

The pathology is discussed. Microscopic studies were made of the appendices in the acute conditions and of others removed in autopsies on patients sixty and over who died of causes other than acute appendicitis. The observations suggested that early massive gangrene might result from diminution or absence of lymphoid follicles in the wall of the appendix, sclerosis of the vessels supplying it, obstruction in its lumen and previous damage to the appendix by inflammation.

It is significant that all the eleven patients who had acute appendicitis without perforation survived after appendectomy. We do not subscribe to the so-called conservative therapy as a routine in which the appendix is not removed or in which abscesses or peritonitis are not drained. Antibiotic therapy has supplemental rather than substitutional value for surgery. Appendectomy is indicated except in those cases in which technical difficulty would prolong the operative time to such an extent that the hazard to life would be markedly increased or when additional trauma would be instrumental in further spread of infection. Generally, the McBurney incision is the most preferable.

REFERENCES

1. Taylor, H. Appendicitis in the aged. *Lancet*, 2: 937, 1935.
2. Carp, L. Basic principles in geriatric surgery. *Ann. Surg.*, 123: 1101, 1946.
3. Carp, L. The causes and possible reduction of operative mortality in geriatric surgery, with an analysis of 100 consecutive autopsy records. *Surg., Gynec. & Obst.*, 87: 1, 1948.
4. Carp, L. Mortality in geriatric surgery. *Brit. M. J.*, 2: 1198, 1950.
5. Carp, L. Common problems in geriatric surgery. *Geriatrics*, 6: 100, 1951.
6. Tashiro, S. and Zinninger, M. M. Appendicitis: a review of nine hundred and thirty-six cases at the Cincinnati General Hospital. *Arch. Surg.*, 53: 545, 1946.
7. Thieme, E. T. Appendicitis. A ten year survey: 1935 through 1944. *Arch. Surg.*, 59: 514, 1949.
8. Collins, D. C. Present concepts in the management of both chronic and acute appendicitis: with a report on 12,813 consecutive appendectomies. *J. Internat. Coll. Surgeons*, 11: 154, 1948.
9. Boyce, F. F. Acute appendicitis in middle and late life. An analysis of 421 cases in individuals over 39 years of age. *Amer. J. Digest. Dis.*, 8: 223, 1941.
10. Lewin, J. A clinical study of appendicitis in old age. *Brit. J. Surg.*, 19: 63, 1931.

11. Powers, J. H. Acute appendicitis during the later decades of life: some remarks on the incidence of the disease in a rural area. *Ann. Surg.*, 117: 221, 1943.
12. Stalker, L. K. Appendicitis among individuals more than sixty years of age. *Surg., Gynec. & Obst.*, 71: 54, 1940.
13. Wood, C. B. Acute appendicitis in the aged. A study of 43 cases occurring after the age of 60. *Am. J. Surg.*, 26: 321, 1934.
14. Boyce, F. F. Acute appendicitis in the aging Negro. *Ann. Surg.*, 133: 631, 1951.
15. Maes, U. and McFetridge, E. M. Acute appendicitis at the extremes of life. *Soutb. Surgeon*, 4: 422, 1935.
16. Bernardo-Comel, M. C. Il tessuto linfoide dell' appendice umana nelle varie eta della vita. *Policlinico, (sez. prat.)*, 44: 1857, 1937.
17. Stefanelli, C. L'appendice acuta nei sogetti: de eta e nel vecchio. *Policlinico (sez. cbir.)*, 43: 644, 1936.
18. Miangolarra, C. J. Age factors in acute appendicitis. *New Orleans M. & S. J.*, 92: 496, 1940.
19. Garlock, J. H. The use of penicillin in surgical infections. A note of warning. *New York State J. Med.*, 47: 1604, 1947.
20. Schullinger, R. N. Observations on mortality from acute appendicitis at a university hospital, 1916–1946. *Ann. Surg.*, 126: 448, 1947.
21. Boyce, F. F. Acute appendicitis: conservative therapy versus first principles. *Ann. Surg.*, 133: 428, 1951.
22. Mueller, R. S. The local use of sulfonamide in the treatment of acute appendicitis. *Ann. Surg.*, 122: 625, 1945.
23. Meyer, K. A., Requarth, W. H. and Kozoll, D. C. Progress in the treatment of acute appendicitis. *A. J. Surg.*, 72: 830, 1946.
24. Hoerr, S. Factors in the reduction of mortality in appendicitis. *Surgery*, 22: 402, 1947.
25. Strohl, E. L., and Sarver, F. E. Acute appendicitis. *Arcb. Surg.*, 55: 530, 1947.
26. Ray, B. S. A study of appendicitis—1500 cases at New York Hospital. *New York State J. Med.*, 38: 412, 1938.
27. Darling, A. P. and McIver, M. A. Acute appendicitis in a rural community. *Ann. Surg.*, 131: 307, 1950.
28. Barrow, W. Acute appendicitis in youth and old age. *Am. J. Surg.*, 53: 242, 1941.
29. Fitch, E. M. Appendicitis in people over fifty years of age. *New England J. Med.*, 198: 348, 1928.
30. Green, H. W. and Watkins, R. M. Appendicitis in Cleveland. *Surg., Gynec. & Obst.*, 83: 613, 1946.
31. Jennings, J. E., Burger, H. H. and Jacobi, M. Acute appendicitis. A clinical and pathological study of 1680 consecutive cases. *Arcb. Surg.*, 44: 896, 1942.
32. Goldsmith, W. S. Acute appendicitis in elderly patients. *J. M. A. Georgia*, 20: 299, 1931.

IS THE REFLUX OF BILE INTO THE PANCREATIC DUCTS A NORMAL OR ABNORMAL PHYSIOLOGIC PROCESS?*

N. Frederick Hicken, M.D. and A. James McAllister, M.D.
Salt Lake City, Utah

THE roentgenographic visualization of the pancreatic and bile ducts by operative and postoperative cholangiograms provides an excellent method for studying the anatomic and physiologic relationship of these two ductal systems. The frequent association of cholecystopathies and acute pancreatitis has been interpreted to indicate that pathologic dysfunctions of the biliary system might effect the pancreas adversely. Opie[3] and his followers believe that obstructive lesions of the ampulla of Vater provoke regurgitation of bile into the pancreatic ducts, thus permitting the activated enzymes to initiate a necrotizing process. Other investigators[4] hold that there is a constant admixture of bile and pancreatic ferments in both ductal systems and that it requires more than the presence of these two secretions to produce tissue autolysis. Unfortunately this controversial problem still awaits clarification.

Because normal digestive physiology requires the admixture of bile and pancreatic enzymes, nature has arranged their respective ductal systems so these powerful proteolytic ferments can be brought together. In about 30 per cent of the cases the admixture occurs in the ampulla of Vater, which is the common channel formed by the union of the choledochus and the duct of Wirsung. In the remainder of cases these two ducts empty their contents directly into the duodenum, either through a common papilla or by means of separate orifices. It is apparent that the duodenal lumen functions as a mixing chamber for these patients. Figure 1 is a schematic representation of these variations.

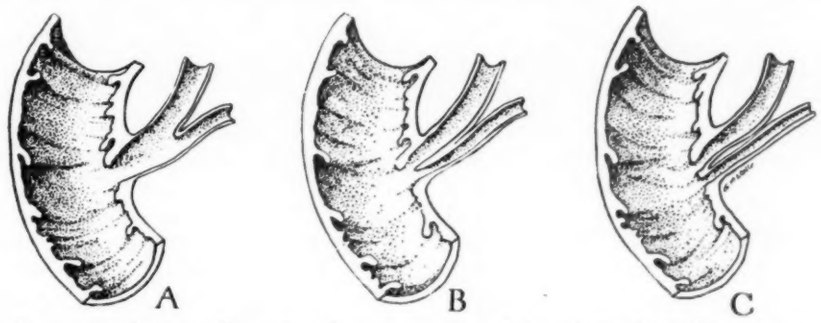


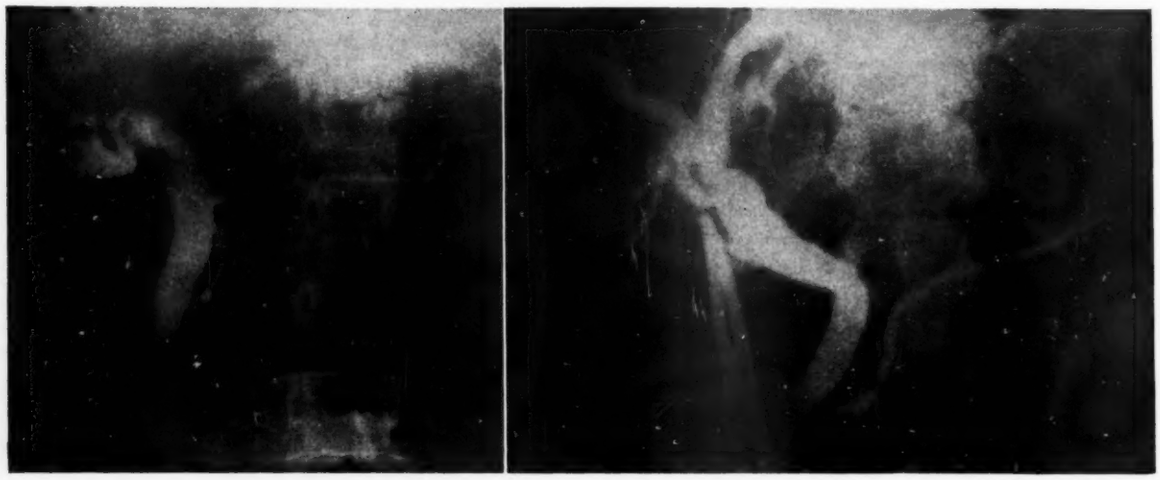
FIG. 1. A, the ampullary type has a common mixing channel which measures from 1.5 to 2.5 cm. in length. B, the papilla of Vater type has no common channel, as both ductal systems empty into the duodenum through a common stoma. C, in the separate type both the pancreatic and biliary systems have their own individual duodenal stomas.

Most of our information concerning the functional and anatomic relationship between the biliary and pancreatic systems have been obtained from postmortem deductions and from animal experimentation. Dragstedt[2] has suggested that if physiologic studies could be made on patients having dysfunctions of these systems some of the existing confusion might be eliminated.

PROBLEM

Investigations of the pathologic disturbances of the pancreatic and bile ducts can be approached from many angles, but this study is concerned only with the following questions: Is the anatomic arrangement of the pancreatic and bile ducts such that they form an "open channel" for the admixture of their respective secretions? Is it possible for bile to flow into

* From the Department of Surgery, University College of Medicine, and the Surgical Service of the Latter Day Saints Hospital, Salt Lake City, Utah.



2 3

FIG. 2. Operative cholangiogram obtained by injecting diodrast directly into the gallbladder, under 100 mm. of water pressure. Calculi can be seen in the gallbladder, the common duct and impacted in the ampullary outlet. The two ducts fuse to form a common channel and the diodrast has flowed along the entire course of the duct of Wirsung.

FIG. 3. Operative cholangiogram; note how the two ductal systems empty into the duodenum through a single stoma, there being no common mixing chamber. When the diodrast was injected into the common duct, it flowed into the pancreatic ducts and also escaped into the duodenum.

the pancreatic ducts? Can duodenal secretions regurgitate into these two ductal systems? Does the reflux of bile into the pancreatic ducts excite pathologic changes within the pancreas?

METHOD OF STUDY

The ability of bile to pass from the larger bile ducts into the pancreatic system can be readily determined by cholangiographic studies. Accurate roentgenographic patterns of the pancreatic and bile ducts were obtained in 100 living patients during and following operations on their biliary systems. This was accomplished by injecting a solution of iodopyracet* directly into their gallbladder and bile ducts and then taking an x-ray picture. Iodopyracet was selected as the radiopaque medium because it is freely miscible with bile, and the resulting mixture has such a high degree of fluidity that it readily flows into even the smallest ductal capillaries. Fluoroscopic studies permitted us to follow the course of the contrast medium as it traversed the ductal paths.

In order to determine the normal hydrodynamic pressure within the gallbladder and the ducts manometric studies were made in each case. These values ranged from 100 to 150 mm. of water pressure. After having determined the existing intraductal pressures the contrast medium was injected into the gallbladders or bile ducts under these exact pressures; this was accomplished by using manometric controls. This precludes any controversy concerning "high injection pressures" being responsible for the reflux of bile and contrast mixture into the pancreatic ducts. If the mixture of iodopyracet and bile were able to flow from the bile ducts into the pancreatic system, it seems logical to assume that bile could and would traverse these same patent channels. In every case in which the contrast mixture was seen to regurgitate into the pancreatic ducts biopsies were taken from the uncinate process of the pancreas in order to determine the presence or absence of pathologic changes.

Every patient in this series had sufficient pathologic disturbances of the biliary system to necessitate surgical explorations. One group, consisting of eighty patients, had cholangiograms made while they were on the operating table, before any corrective measures were performed. This provided an excellent method for determining the manner in which intraductal obstructions, whether due to stones, strictures, neoplasms or spasms of the sphincter of Oddi, influenced the flow and admixture of pancreatic and biliary enzymes. A second group, of fifty patients who had drainage tubes placed in their gallbladders or bile ducts, was studied by postoperative cholangiography. Many of the same patients were studied on the operating table

* Diodrast, Winthrop Chemical Co.

4A 4B

FIG. 4. A, operative cholangiogram was obtained by injecting diodrast into common duct through a small catheter. Both the pancreatic and biliary ducts were filled with the diodrast and much of it had escaped into the duodenum through the gapping papilla of Vater. B, an x-ray film taken three minutes later, showed that the diodrast which had flowed into the duct of Wirsung had escaped into the duodenum. Apparently there was no organic obstruction present.

and later were re-examined by injecting the contrast medium into their drainage tubes. This made it possible to follow the sequence of events which occur after the removal of intraductal obstructions.

ANALYSIS OF MATERIAL

The cholangiograms provided an excellent radiographic pattern of the pancreatic and biliary ductal systems. Three distinct anatomic varieties were encountered. In the ampullary type, found in 30 per cent of the patients, the choledochus and the duct of Wirsung united to form at the ampulla of Vater. (Fig. 2.) This common channel measured from 1.5 to 2.5 cm. in length. In approximately 75 per cent of the cases the duct of Wirsung entered the common bile duct at right angles, while in the remainder an acute angle was formed at their junction. Interestingly, we were able to follow the diodrast by fluoroscopic visualization as it flowed down the common bile duct into the ampulla of Vater, from whence it slowly ascended the patent duct of Wirsung. While the contrast fluid and bile were flowing into the pancreatic ducts, some of it was escaping through the relaxed sphincter of Oddi into the duodenum.

In the second group of fifty-seven patients the choledochus and the duct of Wirsung united at the common papillary orifice to empty their contents into the duodenum. (Fig. 3.) It is apparent that in these cases there was no common mixing chamber for the bile and pancreatic secretions. Under fluoroscopic vision the contrast fluid was injected into the common bile duct; it flowed into the duodenum through this common papilla and at the same time a portion of the contrast fluids was seen to reflux into the patent duct of Wirsung. The sphincter of Oddi was relaxed for the diodrast was seen to enter the duodenum, so we were not injecting against the resistance of a tonic sphincter. There was no stasis of contrast fluid in either ductal system, as x-ray films taken three minutes later failed to show any retention. (Fig. 4.) This indicates that there was no pathologic obstruction of the sphincteric outlet to account for the filling of the duct of Wirsung. The reflux occurred in over 70 per cent of the patients having normal ductal systems.

The third variety, found in thirteen patients, was characterized by having their bile and pancreatic ducts empty into the duodenum through separate stomas. (Fig. 5.) There were no communicating channels between the two systems. When the contrast medium was injected into the gallbladder or common bile duct, it readily escaped into the duodenum through

5 6

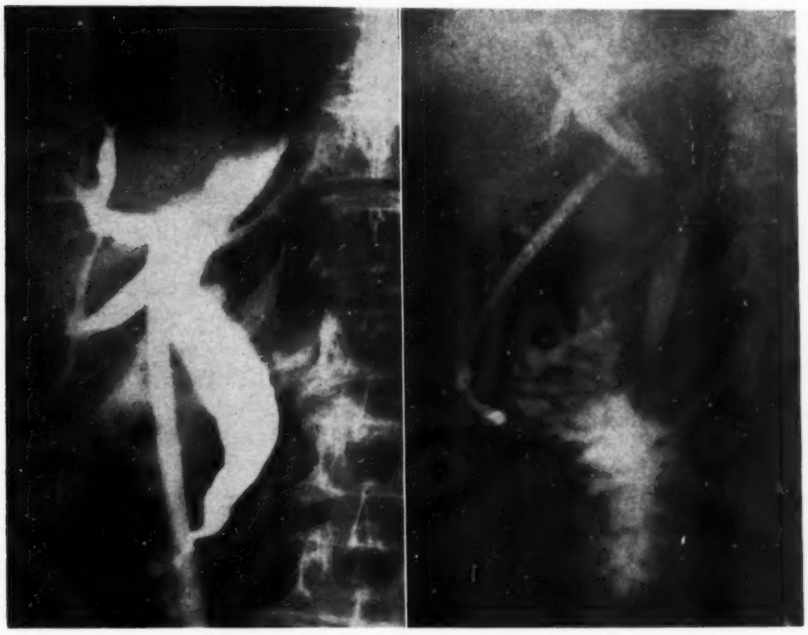
FIG. 5. Operative cholangiogram; the diodrast, which was injected into the choledochus, flowed directly into the duodenum, puddled and then regurgitated along the patent duct of Wirsung. These two systems have separate openings into the duodenum. Note the small calculus in the stump of the cystic duct.

FIG. 6. The operative cholangiogram clearly outlines the two ductal systems and their separate duodenal stomas. The diodrast, being injected into the common bile duct, had to enter the duodenum before it could regurgitate into the duct of Wirsung.

its own separate orifice, puddled in the intestinal lumen and then slowly regurgitated along the duct of Wirsung. (Fig. 6.) It seems reasonable to believe that when the common duct evacuates its content the sphincter of Oddi becomes relaxed, and this permits the stomal orifice of the duct of Wirsung to open; otherwise the reflux phenomenon could not occur.

Reinhoff and Pickrell[5] maintain that the "open channel" therapy is tenable only in those patients having a common ampullary chamber. We have demonstrated, however, the presence of this reflux phenomenon in fifty-seven patients in whom the bile and pancreatic ducts discharged their contents into the duodenum through a common orifice, and in thirteen subjects in whom these two ductal systems had separate or individual evacuating openings. Apparently it is possible for bile to flow into the pancreatic ducts regardless of the anatomic confirmation of their terminal orifices. This reflux phenomenon occurs much more frequently than is realized.

Much has been written about the manner in which intraductal calculi produce alterations in the hydrodynamics of the pancreatic and biliary systems.[1] Do stones cause complete obstruction of the ductal systems, thus effecting a stagnation of secretions? Careful manometric and radiographic visualizations were made in twenty-five cases in which the common duct contained calculi and the pancreatic ducts were visualized by the refluxing contrast solutions. By visualization studies the stones were found to be in the terminal portion of the choledochus in eight instances, in the common duct before it joined the duct of Wirsung in eight other cases and in nine patients the ducts were filled with many stones and biliary sediment. In some instances it was theoretically possible for the stones to obstruct both the flow of bile and the pancreatic enzymes and in others only slightly impede the flow of bile. Cholangiographic visualizations indicated that not a single patient had complete obstruction of the ductal systems in spite of the fact as many as



7A 7B

FIG. 7. A, postoperative cholangiogram made by injecting diodrast into the common duct under 125 mm. of pressure. The swollen edematous pancreas has produced a compressive occlusion of the papilla of Vater, as is evidenced by the dilatation of the choledochus. In spite of this obstruction the duct of Wirsung is still patent as the diodrast refluxed along its lumen and a small portion escaped into the duodenum. B, no retention of contrast fluid in the pancreatic ducts as seen on film taken three minutes later.

thirty-six stones were removed from the larger bile ducts. Four patients were deeply jaundiced but the bile and contrast fluid were able to flow around the intraductal stones and escape into the duodenum, and also regurgitate into the pancreatic ducts. (Fig. 7.)

We found that intraductal stones do not always increase the intraductal pressures, hence the factor of obstruction seemed to play a minor role. Manometric determinations were taken before any of the offending calculi were removed. This was accomplished by inserting a large needle into the common bile duct and recording the intraductal tension. Surprisingly, the pressure gradients varied from 100 to 150 mm. of water pressure, which represents a normal tension of the biliary system.

These same patients were studied on the eighth postoperative day by utilizing indwelling T tubes for manometeric determinations. The postoperative intraductal pressures were identical with those made before the removal of the stones. We are compelled to believe, therefore, that the average choledochal stone does not increase the pressures within the biliary system, nor does its removal produce any changes in these values.

It has been suggested that intraductal stones, by causing a reflux spasm of the sphincter of Oddi, can close the ampullary orifice thereby producing a stasis of biliary and pancreatic enzymes.[1] Our observations do not support this contention. In these twenty-five cases of choledocholithiasis seventy-five fluoroscopic and manometeric studies were made to determine the absence or presence of sphincteric spasm. In every instance the intraductal pressures were below 150 mm. of water pressure, and the contrast fluid was seen to flow around the

TABLE I

RELATION OF PANCREATIC AND BILE DUCTS

Types of Openings	No. of Cases	Gall-stones	Duct Stones	Pan-creatic Com-pression	No Ob-struc-tion
Common ampulla....	30	20	7	8	20
Common papilla.....	57	47	13	17	38
Separate openings....	13	13	5	4	9
Totals.....	100	80	25	29	67

stones, pass through the patent ampullary orifice and escape into the duodenum. (Table 1.) This leads us to believe that the regurgitation of bile into pancreatic ducts occurs not because of ductal obstruction but rather because the pancreatic ducts are patent. This is further substantiated by the fact that in sixty-seven patients, in which no intraductal pathologic condition could be demonstrated, the bile was able to reflux into the duct of Wirsung.

RELATIONSHIP OF PANCREATIC REFLUX TO PANCREATITIS

Dragstedt states that "approximately 60 per cent of the cases of acute pancreatitis occurring in man have developed as a direct result of the passage of bile into the pancreatic ducts." If this concept is correct, we should have encountered a high percentage of pancreatitis in the 100 patients in whom we were able to demonstrate the reflux phenomenon. We were able to establish a positive diagnosis of biliary tract disease in every instance, there being seventy-five patients having cholelithiasis, 25 with choledocholithiasis, and 3 having strictures of the common bile duct. Routine biopsies were taken from the uncinate process of the pancreas, and in only three instances was the pathologist able to find sufficient morphologic changes to warrant the diagnosis of acute or subacute pancreatitis. To our knowledge this is the first time it has been shown that the reflux of bile into the pancreatic ducts could take place and yet the incidence of pancreatitis was very low. There were five cases in which the pathologist reported, "acute inflammatory cholecystitis," and even though the bile was seen to regurgitate into the duct of Wirsung in these cases no evidence of inflammatory changes within the pancreas could be found in the biopsied tissues. Apparently some segment of the biliary tract can be involved in an inflammatory process and its bile can enter the pancreatic ducts without producing inflammatory changes within the organ.

This paper is not concerned with the pathogenicity of acute pancreatitis. We have merely presented some interesting observations made on 100 living patients in whom the reflux of bile into the pancreatic ducts was observed. While no definite solution to this intriguing problem can be formulated, at least we are compelled to re-evaluate some of the older concepts concerning its pathogenicity of acute pancreatitis. It is possible that continued studies along these physiologic lines, rather than animal experimentation, will provide the answer to this tantalizing question.

SUMMARY

Two questions have been considered: Under what conditions does bile reflux into the pancreatic ducts? Does this phenomenon have any pathologic significance?

This study is concerned with an analysis of 100 cases of cholelithiasis and choledocholithiasis in which the pancreatic ducts were visualized by operative and postoperative cholangiography. The choledochus and the duct of Wirsung formed a common ampullary chan nel in thirty cases; in fifty-seven cases they both opened into the duodenum through a shallow duodenal papilla, and in thirteen the ductal systems had separate duodenal orifices. In all three varieties the contrast fluid, which was injected into the gallbladders or bile ducts, was seen to flow into the duct of Wirsung; therefore, we must assume that the reflux phenomenon occurs in spite of the anatomic arrangement of the terminal portion of these ducts. (Table 1.) This is contrary to the "open channel" theory which has held sway for so many years.

It is commonly believed that cholecystopathies and the reflux of bile are precursors of acute pancreatitis. In this series of 100 patients, all of whom had confirmed disease of the biliary tract and associated pancreatic reflux, only three instances of acute or subacute pancreatitis were encountered.

Apparently the reflux of bile into the pancreatic ducts is a normal physiologic process and is seldom productive of inflammatory changes within the pancreas.

REFERENCES

1. Cameron, A. L. and Noble, J. F. Reflux of bile up the duct of Wirsung, caused by an impacted stone. *J. A. M. A.*, 82: 1410, 1924.
2. Dragstedt, L. R., Haymond, H. E. and Ellis, J. C. Pathogenesis of acute pancreatitis. *Arch. Surg.*, 28: 232–291, 1934.
3. Opie, E. L. The relation of cholelithiasis to diseases of the pancreas and fat necrosis. *Am. J. M. Sc.*, 121: 27, 1901.
4. Rich, A. R. and Duff, G. L. Experimental and pathological studies on the pathogenesis of acute hemorrhagic pancreatitis. *Bull. Johns Hopkins Hosp.*, 58: 137, 1936.
5. Reinhoff, W. F. and Pickrell, K. L. Pancreatitis. *Arch. Surg.*, 51: 205–219, 1945.

FAMILIAL INCIDENCE IN POLYCYSTIC KIDNEY DISEASE*

REPORT OF THREE CASES

EDWIN J. ADLERMAN, M.D.
New York, New York

POLYCYSTIC disease of the kidneys exists in two principal forms: (1) An early type comprising 30 per cent in which the affected subjects are either stillborn or die in infancy; and (2) an adult group in which symptoms appear after the pubertal years with slow progression of the disease associated with enlarging renal masses and failing kidney function.

The disease begins in the prenatal period and infants may be stillborn because of this or associated developmental abnormalities. The paucity of clinically evident cases in childhood and adolescence is explained by assuming either that the cysts do not increase in size or number at this time or that hypertrophy of the remaining normal parenchyma provides a temporary compensatory mechanism. Whether persons without clinical manifestations who transmit the disease to their offspring have normal kidneys or subclinical forms of the disease has not been established.

Transmission is apparently bisexual and mediated by a dominant gene. This congenital anomaly has presented the urologist with varied problems. In itself productive of eventual renal failure, added insult often occurs in the form of infection, calculus, neoplasm, tuberculosis, hemorrhage, fatty pelvic sequestra, renal rickets, massive calcinosis and ureteral anomalies.

INCIDENCE

Mayers[1] noted the incidence of the disease in over 1,300,000 clinical admissions as 1 to 4,000 and 1 to 400 in 87,000 autopsies, with no essential difference related to sex. The morbidity and mortality from the condition is far greater than generally recognized. In the adult the average age at onset of symptoms was thirty-eight and at death fifty. Montgomery[2] and others compiled statistical studies covering the period from 1892 to 1934 in which the incidence of infection was 50 per cent, stone formation 20 and hypertension 60 per cent.

PATHOGENESIS

Numerous theories have been promulgated. Huber[3] and Staemmler[4] believed that improper proliferation of the metanephrogenic anlage occurred, preventing normal union of its elements with those of the developing ureter and pelvis. In a long period of fetal life the development of the kidneys would be apparently normal. In polycystic disease the focal cystic dilatations of uriniferous tubules and collecting ducts occurred after differentiation of the metanephrogenic anlage, and after the union of its elements with collecting ducts the isolation as cysts of segments of these nephrons followed. Anastomoses among these cysts resulted from continued proliferation of these elements and from rupture of their walls. These changes were thought to be degenerative since they resembled the stages in the normal degeneration of the mesonephros and of normally vestigal elements of the metanephros.

Teuscher[5] thought that an overproduction of excretory elements occurred, followed with reduction taking place in the normal kidney. Persistence of these glomeruli and their tubules presumed to explain polycystic kidney formation.

Kampmeier[6] later demonstrated that early generations of uriniferous tubules and their glomeruli normally become detached from collecting ducts and join collecting ducts of higher orders. An early overproduction of uriniferous elements was then followed with a degeneration and reduction in the numbers of these elements. Some of these renal tubules remain temporarily as cysts and it was suggested that the persistence of large numbers

* From the Department of Urology, Morrisania City Hospital, New York, N. Y.

of these cysts might cause polycystic disease. Felix[7] likewise considered a similar etiology.

Lambert,[8] however, noted that polycystic disease of the newborn differs from that of the adult. In the infant no cysts connect with collecting tubules to form a functioning unit. In the adult similar cysts containing glomeruli with patent vessels did not connect with a patent convoluted tubule. Other cysts were noted as outpouchings along the course of a working nephron. Lambert believed the cause to be unexplained. Some adult and newborn cysts are closed systems, but in the adult cysts occur along the tubular course and in the renal pelvis. Functional activity of the cystic nephrons was demonstrated.

SURGICAL CONSIDERATIONS

Conservative surgery for polycystic kidney disease was given greatest impetus by Rovsing[9] in 1910. The attitude of Goldstein's[10] procedure in 1936 and the work of W. W. Young[11] in using 5 per cent sodium morrhuate for sclerosing the cysts suggested a procedure combining the advantage of both these operations. Routine surgical intervention is not advocated by Mayer[1] unless large cysts are suspected and such indications exist as persistent pain, infection, hematuria and impending renal failure.

Dodson[12] advocates surgical intervention before obstruction, stone formation, infection, severe hemorrhage or incapacitating pain occur and presents two cases wherein he acted according to the theory that it seems logical to operate as soon as the disease is recognized. A portion of the wall of the superficial cysts was excised and as many as possible of the more deeply situated ones were aspirated.

Stevens[13] presented two patients, difficult metabolic problems, with acidosis, calcium, chloride and protein deficiencies, high non-protein nitrogen and blood urea nitrogen, low hemoglobin and red cell count. One patient, following a nephrectomy for acute infection, lived for twenty-one years. After removal of the kidney phenolsulfonphthalein excretion remained low and for the last ten years of life, blood urea nitrogen was 30 mg. per cent or more. Her remaining kidney was explored three times to drain perirenal abscesses and infected cysts. Each operation relieved an acute condition. In the second case the patient also had a polycystic liver.

These patients apparently have great ability to carry on for years with great physical activity despite low renal function and high figures for non-protein nitrogenous constituents of the blood.

Schwartz[14] has reported a case of a patient who survived eleven years following left nephrectomy, drainage of a right perinephric abscess and three operations for osteomyelitis of a metacarpal bone and both tibias.

Branham[15] presented a case of a young woman with a solitary polycystic kidney who for over eight years maintained a relatively normal life despite showing, almost constantly, serious symptoms of cardiovascular-renal decompensation. In addition, she became pregnant, was delivered of a normal child and personally cared for the child for over four years. Carlson[16] and Lynch and Thompson[17] record further observations on these solitary renal cases, the former in an adult, the latter in an infant.

Harrison and Botsford[18] recommend surgical intervention because of massive hemorrhage and infection; Mathe[19] relieved a patient with intercurrent hydronephrosis of one polycystic kidney, secondary to renal torsion, by decapping, puncture, cyst cauterization, nephropexy and sympathectomy. Cahill and Fish,[20] Rolnick,[21] Low and Coakley,[22] Bobbitt,[23] Milliken[24] and Berardi[25] further discuss surgical considerations.

IMPROVEMENT IN PROGNOSIS

Prior to surgical intervention adequate investigation of chemical balance must be carried out. Aside from changes incident to acidosis and electrolyte imbalance the interesting problem of renal rickets in children often arises.

Bobbitt[23] noted a long survival (five to twenty-five years) after diagnosis in 55 to 65 per cent of affected individuals. Of these, 15 per cent lived two to four years and 30 per cent died within two years of onset of symptoms. The average age at death was fifty years. Signs, symptoms, preoperative preparation and operative technic have been detailed by previous authors.

Prognosis is good as long as renal function remains good; infection may be an important factor in hastening or initiating the terminal stage. How much renal tissue is necessary for life and comfort varies markedly in these individuals.[26,27]

FAMILIAL STUDIES AND CASE ANALYSES

Dourmashkin[28] reviewing twenty-six cases seen during the period from 1920 to 1950 noted a marked familial incidence in three, with a much improved prognosis in those surgically treated during 1940 to 1950 with adjuvant sulfonamide and antibiotic therapy.

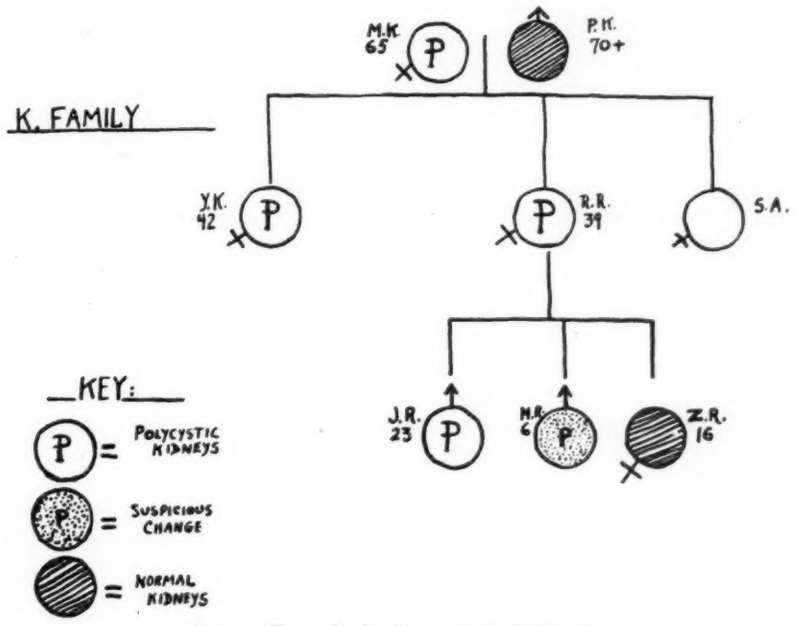


FIG. 1. Genealogic chart of the K family.

The following three cases illustrate the familial incidence of polycystic disease.

CASE 1. *The K family* (Fig. 1): Y. K., No. 10946-48, a forty-two year old white woman, was admitted to the hospital on October 22, 1948, because of a mass in the left upper quadrant discovered during routine physical examination.

The initial physical review revealed a heart slightly enlarged to the left, with a systolic apical murmur. The pulse rate was 80, with regular cardiac sinus rhythm, and blood pressure was 158 systolic over 106 diastolic. Abdominal examination disclosed a moderately firm, movable, tender mass in the left upper quadrant extending to the iliac crest. The lower pole of the right kidney was palpable 1 inch below the costal margin.

At that time red blood cell count was 3.95 million per cu. mm., hemoglobin 14.1 gm. per cent and leukocytes 6, 800 per cu. mm., with a differential count of 62 polymorphs, 2 transitional forms, 30 lymphocytes, 2 eosinophiles and 4 monocytes. Urinalysis revealed a specific gravity of 1.020, slight trace of albumen, and 3 to 5 white cells per microscopic high power field. Total phenolsulfonphthalein excretion was 75 per cent in two hours.

Cystoscopy demonstrated a normal bladder and ureteral orifices, each of the latter easily admitting a No. 6 French ureteral catheter. A rapid intermittent drip was noted on the right, with a slow drip on the left. Urine cultures and microscopic examinations were negative. Indigo carmine (5 cc. of 0.8 per cent solution intravenously) appeared in eight minutes on the right and forty minutes on the left. Retrograde pyelograms showed the characteristic appearance of polycystic disease. Both kidneys were markedly enlarged, with dilatation and distortion of the right renal pelvis and calyces, non-visualization of the left inferior major calyx and a massive bulbous contour of the left lower renal pole.

Subsequent urine specimens contained 10 to 15 white cells per microscopic high power field, with occasional red cells. The blood urea nitrogen was 26 mg. per cent, blood sugar 104 mg. per cent, and the Mazzini blood serologic test was negative.

In view of the pyelographic appearance and poor left renal function further investigations were made. Excretion urography on November 13, 1948, demonstrated diminished function on the left; repeated differential phenolsulfonphthalein excretion tests showed the dye ap-

pearing on the right in six minutes and on the left in fourteen and a half minutes, with poor concentration in the latter. Urine cultures remained negative.

With a view toward restoration of renal function a left renal exploration was carried out on November 26, 1948. The diagnosis was confirmed and a Rovsing operation performed. Fluid cultures from the cysts revealed nonhemolytic staphylococcus and a postoperative course of penicillin was administered. The aspirated cyst fluid also contained 742 mg. per cent of sodium chloride and 33 mg. per cent of urea nitrogen which would corroborate Lambert's[8] observations.

Recovery was rapid and intravenous urography on December 13, 1948, showed good left-sided function. Endoscopic investigation on December 16, 1948, denoted improved left renal indigo carmine and phthalein excretion. Pyelography demonstrated a corresponding decrease in distortion and compression of the left renal calyces. The patient has been followed up to date and at present a Rovsing operation is contemplated on a right polycystic kidney which was found in the course of examination. Blood chemistry-electrolyte determinations have remained within normal limits.

In view of the familial incidence of this disease urologic investigation was suggested to all the available family members. The patient had volunteered the fact that her younger sister had undergone operative intervention for kidney disease and that their mother had a renal disorder. Urologic reports on the patient's sister, R. R., three children of R. R., and family history follow. Due to illness urologic examination on the mother, aged 65, was postponed.

R. R., No. 552-49, a thirty-nine year old white woman, sister of the foregoing patient, presented a history of an operative procedure at another hospital in 1948. Transperitoneal removal of an infected cystic portion of the right kidney with puncture of remaining cysts was performed. Postoperatively she had noted frequency, burning on urination, low back pain and a sensation of heaviness in the left upper abdomen.

Physical findings were as follows: blood pressure 130/80, and a palpable mass lateral to the lower border of a well healed right paramedian scar. A hard tender mass was palpable in the left upper quadrant, extending from the costal border to the level of the umbilicus and medially to the midline.

Urine contained traces of albumen with leukocytes and red blood cells. Excretion urography revealed faint visualization on the right side and a markedly enlarged left kidney with the typical pyelocalyceal configuration of polycystic disease. Retrograde pyelography confirmed this diagnosis; phenolsulfonphthalein function tests demonstrated appearance of the dye on the right in fifteen minutes in poor concentration and on the left in eight minutes in good concentration. The patient desired no surgery but consented to further study of her three children.

Intravenous urography on (1) M. R., a six year old boy, demonstrated pyelographic changes suspicious of the disease. The calyceal configuration on the right side appeared distorted. Physical examination was normal. (2) Z. R., a sixteen year old girl, demonstrated neither physical nor urographic evidence of polycystic disease. (3) J. R., a twenty-three year old man, did not present physical signs or symptoms of the disease, but excretion urography demonstrated changes indicative of calyceal compression in both kidneys. Blood pressure was 130/70. Periodic examinations to determine whether this change is progressive are contemplated. A third sister, S. A., of the foregoing patients Y. R. and R. R., who is residing in Los Angeles, is to undergo intravenous urography at the time of this writing.

Case II. *The R family* (Fig. 2): Mrs. R. F., aged twenty-nine, came under observation for ureteral colic, caused by a small calculus in the lower third of the left ureter which passed spontaneously. Retrograde pyelography at that time showed a pressure effect upon the upper calyx of the right kidney, suggestive of neoplasm. Later observations indicated that the lesion was progressing and exploration was performed. A large polycystic kidney was found, with an orange-sized cyst at the upper pole, and a Rovsing operation was done. Postoperative radiography demonstrated improvement of the right pyelogram and progressive obliteration of the lower calyx of the left kidney.

Pyelographic investigation of the patient's mother, aged fifty-four, revealed the typical appearance of polycystic disease. It was also noted that the patient's grandmother was alive at seventy-two, but her grandfather had died of kidney trouble at an early age. The patient's

uncle, her mother's brother, also had the disease.

In the patient's own generation,* a brother, M. R., age twenty-one, was found to have duplication of the right renal pelvis and ureter with suspicious lobulation of the left renal

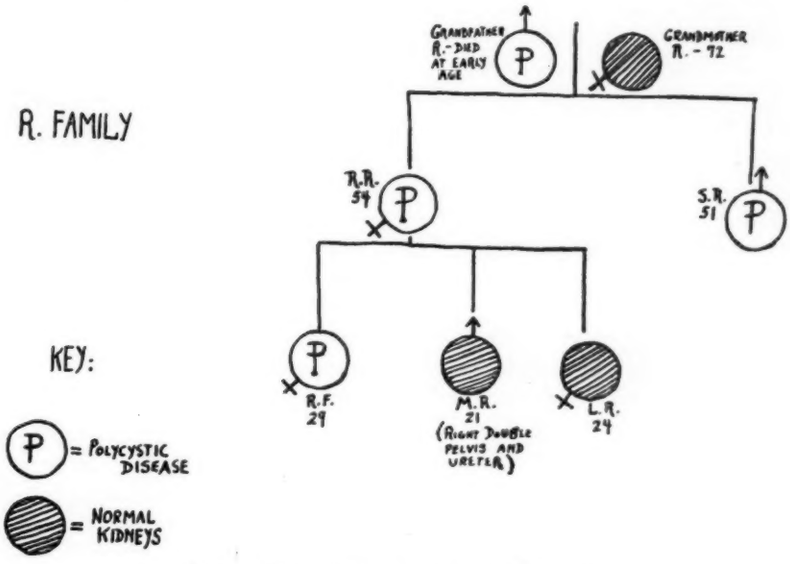


FIG. 2. Genealogic chart of the R family.

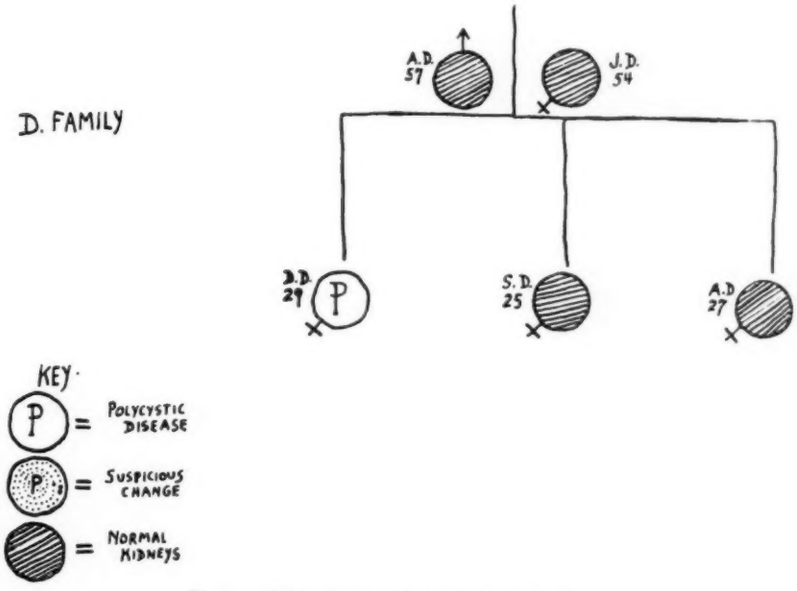


FIG. 3. Genealogic chart of the D family.

outline, while another sister, L. R., aged twenty-four, had a normal urogram.

CASE III. *The D family* (Fig. 3): D. D., No. 950-49, a woman aged twenty-nine, was first admitted in 1936, at the age of fifteen, with hematuria and right flank pain. At that time cystoscopic examination revealed a grossly bloody efflux from the left side, with clear urine on the right. Retrograde pyelograms demonstrated slight dilatation of the right kidney pelvis with comparatively normal calyces. The left kidney showed irregularity in the filling of the pelvis and calyces, particularly the lower ones, with a circumscribed opacity at the lower pole.

Exploration denoted a typical left polycystic

* Clinical data on Family R. was obtained through the courtesy of Dr. Harry Bergman.

kidney and a Rovsing operation was performed. After a course requiring intensive supportive therapy and transfusions the patient was discharged, voiding clear urine.

The patient was readmitted twelve years later, in April, 1948, with emesis, fever and pain on the unoperated side. Study revealed right polycystic disease with pyelonephritis and perinephritis. A right Rovsing operation was performed. Homolateral pleural effusion occurred postoperatively, gradually subsiding, but sepsis continued during the following two months. At that time, June 23, 1948, exploration demonstrated a right perinephric abscess which was drained. The postoperative course remained septic and 46 gm. of streptomycin were administered with ultimate improvement.

Re-examination six months later, January, 1949, when episodes of left renal hematuria occurred, revealed fair renal function with a beginning hypertension and blood urea nitrogen elevations ranging from 48 to 61 mg. per cent. The hematuria ceased on a regimen of rutin and ascorbic acid.

Investigation of the patient's father, aged fifty-seven, revealed normal kidneys; her mother, fifty-seven, also had normal urograms. Of the patient's two sisters, one, twenty-five, had normal excretory urograms and the other, twenty-seven, grava II, para II, showed changes incident to old pyelonephritis in one kidney.

The subsequent course of D. D. was downhill. A left Rovsing for intractable hematuria in 1950 controlled the bleeding for one month. Recurrence of severe bleeding necessitated left nephrectomy in December, 1950, following which renal failure and exodus occurred.

CONCLUSIONS

It is my intent to emphasize that establishment of the diagnosis of polycystic disease in a patient should initiate a comprehensive investigation, in the nature of a case finding study, including therein as many of the afflicted individual's close relatives as it is possible to reach. In two of three families studied the presence of the disease has been disclosed in closely related members. The likelihood of discovering anomalies other than polycystic disease in numbers greater than in the population as a whole is also indicated.

The most that can be expected from purely medical treatment of the disease is management of the impaired renal function. Such measures cannot otherwise influence the progress of the disease. The Rovsing operation in properly selected cases improves renal function, often rehabilitates the patient and increases the life span.

SUMMARY

1. The definition, incidence, pathogenesis, surgical considerations, metabolic aspects and prognosis of polycystic renal disease are discussed.

2. A series of familial studies and case analyses is presented.

3. The importance of comprehensive familial investigation is emphasized.

4. The Rovsing operation, or its modifications, applied in selected cases, results in a relatively comfortable and increased period of normal activity in afflicted individuals.

REFERENCES

1. Mayers, M. M. Polycystic kidney disease. *Tr. West. Sect., Am. Urol. A*, 14: 153–158, 1947.
2. Montgomery, T. R. The prognosis in polycystic disease. *Tr. West. Sect., Am. Urol. A.*, 14: 159–165, 1947.
3. Huber, G. C. On the development and shape of uriniferous tubules of certain of the higher mammals. *Am. J. Anat.*, 4: 1–96, 1905.
4. Staemmler, M. Ein Beitrag zur Lehre von der Cystenniere. *Beitr. z. path. Anat. u.z. allg. Path.*, 68: 22–57, 1921.
5. Teuscher, M. Ueber die kongenitale Cystenleber mit Cystennieren und Cystenpankreas. *Beitr. z. path. Anat. u.z. allg. Path.*, 75: 459–485, 1926.
6. Kampmeier, O. F. A hitherto unrecognized mode of origin of congenital renal cysts. *Surg., Gynec. & Obst.*, 36: 208–216, 1923.
7. Felix, W. The development of the urogenital organs. In: Manual of Human Embryology, edited by Keibel, F. and Mall, F. P. Philadelphia, 1912. J. B. Lippincott Co.
8. Lambert, P. P. Polycystic disease. *Arch. Path.*, 44: 34–58, 1947.
9. Rovsing, T. Treatment of the multilocular renal cyst with multiple punctures. *Am. J. Urol.*, 8: 120–124, 1912.
10. Goldstein, A. E. A new surgical procedure for treatment of polycystic kidneys. *J. Urol.*, 34: 536–548, 1935.
11. Young, W. W. Sclerosing injection of polycystic kidney following surgical exposure. *J. Urol.*, 55: 323–329, 1946.
12. Dodson, A. I. The surgical treatment of polycystic disease of the kidney: case reports. *J. Urol.*, 57: 209–213, 1947.
13. Stevens, A. R. Cortical infections of polycystic kidneys. *J. Urol.*, 52: 430–436, 1944.
14. Schwartz, R, Case of polycystic kidney disease with unusual features. *J. Urol.*, 51: 476–481, 1944.

15. Branham, D. W. Solitary polycystic kidney and successful pregnancy. *J. Urol.*, 57: 519–520, 1947.
16. Carlson, H. E. Polycystic disease in a solitary kidney. *J. Urol.*, 55: 443–445, 1946.
17. Lynch, K. D. and Thompson, R. F. Unilateral multicystic kidney in an infant. *J. Urol.*, 38: 58–62, 1937.
18. Harrison, J. H. and Botsford, T. W. Experiences in the management of congenital anomaly of the kidney in the Army. *J. Urol.*, 55: 309–322, 1946.
19. Mathe, C. P. Cystic disease of the kidney: diagnosis and treatment. *Tr. West. Sect., Am. Urol. A.*, 15: 44–51, 1948.
20. Cahill, G. F. and Fish, G. W. Surgical aspects of polycystic kidney disease. *Tr. Am. A. Genito-Urin. Surgeons*, 34: 81–87, 1941.
21. Rolnick, H. C. Surgery in polycystic disease of kidney. *J. Urol.*, 47: 648–650, 1942.
22. Low, H. T. and Coakley, H. E. Renal polycystic disease. *Urol. & Cutan. Rev.*, 48: 369–371, 1944.
23. Bobbitt, R. M. Secondary pathological changes in polycystic kidney disease. *J. Urol.*, 50: 131–140, 1943.
24. Milliken, L. F. Cystic diseases of kidney. *Clinics*, 3: 90–102, 1944.
25. Berardi, J. B. Polycystic kidney: report of case. *Urol. & Cutan. Rev.*, 48: 211–212, 1944.
26. Allen, F. M., Scharf, F. and Lundin, H. Clinical and experimental renal deficiency. *J. A. M. A.*, 85: 1698–1701, 1925.
27. Mulsow, F. W. The minimum of renal tissue compatible with life. *J. Iowa M. Soc.*, 19: 274–276, 1929.
28. Dourmashkin, R. L. Personal communication.

Ventricular fibrillation and standstill can be adequately treated by cardiac massage with or without supplemental therapy with injections of epinephrine hydrochloride or other cardiac stimulants, and according to J. H. Kay, cardiac massage for only one or two minutes plus electrical defibrillation will defibrillate practically all hearts in ventricular fibrillation. Kay successfully performed this in 188 experiments on dogs and in only one other instance did he have to supplement this procedure with procaine injections to obtain successful ventricular defibrillation. In none of these experimental animals were any permanent neurologic changes discernible. (*Richard A. Leonardo, M.D.*)

Surgical Review

INTESTINAL OBSTRUCTION*

CHARLES HAMILTON LUPTON, M.D.
Norfolk, Virginia

INTESTINAL obstruction presents one of the most difficult problems in abdominal surgery. Because of the high mortality rate in the delayed recognition of these cases it is mandatory that those surgeons called upon to treat acute conditions of the abdomen thoroughly familiarize themselves with the diagnosis and treatment of intestinal obstruction.

Wangensteen's classification of intestinal obstruction, which follows, is considered the most satisfactory classification: (1) mechanical obstruction; (2) intestinal obstruction due to nervous imbalance (paralytic ileus, dynamic or spastic obstruction); and (3) vascular obstructions (mesenteric embolism, mesenteric thrombosis).

CAUSES OF MECHANICAL INTESTINAL OBSTRUCTION

(*a*) Bands and adhesions—Congenital
Inflammatory
Neoplastic
Traumatic

(*b*) Developmental errors other than congenital stenosis which cause intestinal obstruction

(*c*) Hernia—External
Internal

(*d*) Intussusception

(*e*) Narrowing of lumen of bowel due to:

1. Strictures: Congenital—Atresia
Imperforate anus
Stenosis
Acquired —Inflammatory
Neoplastic
Traumatic

2. Obturation due to: Gallstones
Foreign bodies
Fecal impaction
Hirschsprung's disease (?)

3. Compression from without

(*f*) Volvulus

The most common varieties of bands and adhesions are the inflammatory and traumatic. Bands and adhesions are usually reported as causing the greatest number of cases of mechanical intestinal obstruction. Developmental errors other than congenital stenosis which give rise to intestinal obstruction are an infrequent cause, occurring in about 2 per cent of the cases of mechanical obstructions. Intestinal obstruction due to strangulation of external hernias is a very common type. Internal hernias are a rare cause of the condition. Intussusception occurs most frequently in the early years of life; usually about 75 per cent of the cases occur during the first two years. The ileocolic type is the most frequent. Occasionally carcinoma of the sigmoid will become invaginated into the rectum causing obstruction.

Narrowing of the lumen of the bowel may be due to strictures, obturation and compression from without. Neoplasms are the most frequent and most serious causes of obstruction of the large bowel. Neoplasms and strictures account for 10 per cent or more of the cases of mechanical intestinal obstruction. Some authors list Hirschsprung's disease as a cause of obturation, but according to the newer concept of Hirschsprung's disease it is due to spastic constriction of the rectosigmoid or rectum, with enormous dilation of the colon above the spastic area. Auerbach's plexuses are absent in the spastic area. Nervous imbalance is an important etiologic factor in Hirschsprung's disease and for that reason it probably should be listed under nervous imbalance. Compression from without is most likely to occur where the bowel is fixed and results from the pressure of tumors and masses. It is an infrequent cause of mechanical obstruction.

Volvulus occurs most frequently in the sigmoid. Obstruction usually does not occur until

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there has been torsion of the bowel to at least 180 degrees or more. Occurrence of the obstruction will depend to a great extent upon the length of the mesentery. The longer the mesentery the more likely the bowel to become obstructed by twisting. Volvulus may occur in the small intestine; when it does it is often due to bands and adhesions resulting in the twisting of the bowel.

It has been my experience that the greatest number of cases of mechanical intestinal obstructions is due to bands and adhesions, but some authors state strangulated external hernias cause the greatest number of cases. Most cases of intestinal obstructions are due to mechanical obstructions and nearly two-thirds of these are due to bands and adhesions, and strangulated external hernias. Although most bands and adhesions occur where there has been previous abdominal surgery, we must not lose sight of the fact that mechanical obstructions due to bands and adhesions frequently occur where there has been no previous surgery. Most of those cases result from infection. The next most frequent cause of mechanical intestinal obstructions is neoplasms and strictures. Intussusception, volvulus, internal hernias, Meckel's diverticulum, congenital anomalies (except stenosis), gallstones and foreign bodies account for about 15 to 20 per cent of the cases of mechanical obstructions.

Intestinal Obstruction Due to Nervous Imbalance. Paralytic ileus is an extremely common cause of intestinal obstruction. It occurs often in patients having peritonitis but various grades of it from partial to complete ileus frequently occur following intra-abdominal operations and many other conditions. Paralytic ileus is likely to follow operations in which there has been much handling of the intestines. On the other hand, it may follow abdominal surgery in which there has been very little intestinal handling. Paralytic ileus frequently results from injuries to the abdomen and spinal column, from hemorrhage into the peritoneal cavity and from diseases of the spinal cord, and may result reflexly from many conditions. Spastic or dynamic obstruction is an extremely rare type of intestinal obstruction and the reported cases have been due to a variety of causes. Lead poisoning, neurasthenia and foreign bodies have been reported as giving rise to spastic obstruction. Most cases occur in the colon. In spastic obstruction the wall of the bowel may be thickened if the condition has existed for some time.

Vascular Obstructions. These may be due to arterial embolism or thrombosis of the mesenteric vessels. The superior mesenteric vessels are most frequently involved. Vegetations on the valves of the left side of the heart are thought to be the most frequent causes of embolism of the mesenteric arteries. Thrombosis of the mesenteric veins may result from infected abdominal organs. Embolism is more frequent than thrombosis of the arteries. A majority of reports list arterial occlusion as a more frequent cause of vascular obstruction than venous thrombosis. Vascular obstructions are reported more frequently in the male. They are of rare occurrence but more cases are being recognized than formerly because the condition is better understood and therefore more readily diagnosed.

SYMPTOMS

The symptoms of mechanical intestinal obstruction will vary with the location of the obstruction (whether the large or small bowel is involved), and with the type and degree of the obstruction, that is, whether it is complete or incomplete and if complete whether simple or strangulating. It must be emphasized in early mechanical obstruction the patient does not as a rule appear particularly ill. For this reason the seriousness of the condition may be overlooked unless the examining physician takes a very careful history and auscultates the abdomen during the cramps. *Auscultation of the abdomen of all patients having abdominal cramps is of extreme importance and should never be omitted.* Pain, nausea, vomiting, tenderness and distention are the chief symptoms. Constipation may be a prominent symptoms, but in intussusception and at times in mesenteric thrombosis the patient may have a number of stools containing blood and mucus.

Pain is the earliest symptom of mechanical obstruction. The pain is crampy, intermittent and of short duration, usually lasting from about thirty seconds to two or three minutes. Usually the cramps soon recur and may become severe. Ordinarily no discomfort is experienced between the cramp-like pains in early simple obstruction. However, later there may be continuous discomfort between the cramp-like pains; but when this occurs, there may be

beginning interference with the circulation of the bowel. In strangulating obstructions there are usually continuous pains in addition to the colicky pains. Often in strangulating obstructions, especially if there is any particular amount of the bowel involved, there will be transudation of fluid and blood into the peritoneal cavity which would give rise to a continuous type of pain. Therefore, whenever there is discomfort between the colicky pains we should think of the strangulating type of obstruction. The cramps in late obstructions are not as marked as in the early phases and do not recur as often. *The occurrence of rhythmic, cramp-like, colicky pains of short duration with accentuation of noises (borborygmi) at the height of the pain establishes the cramps as intestinal colic.* After the diagnosis of intestinal colic has been determined by the intimate relationship between the occurrence of the noises and pains, one should rule out other conditions such as enterocolitis, food indiscretion and allergy, which may be accompanied with intestinal colic, before a diagnosis of mechanical intestinal obstruction is made. A good policy, and one which we have followed for several years, is to consider all cases of intestinal colic as due to mechanical intestinal obstruction until the diagnosis is either confirmed or ruled out.

Vomiting is an early and prominent symptom in mechanical obstruction of the small bowel; it is often profuse and the higher the obstruction the more prominent the vomiting. In obstruction low in the ileum vomiting may be somewhat delayed and it will not be as profuse as in the higher obstructions. When fecal vomiting occurs, the obstruction is usually in the small bowel and, of course, the condition of the patient is critical. *Vomiting is not a prominent symptom of obstruction of the large bowel; in fact it ordinarily occurs late and there may be enormous distention without the occurrence of vomiting.* When much vomiting does occur in large bowel obstruction, it is often reflex or may be due to peritonitis. The ileocecal valve and sphincter when adequate (in more than a majority of cases) do not permit regurgitation of any particular consequence of the contents of the colon into the ileum, thereby forming practically a closed loop. Therefore, vomiting would occur late and would not be as marked as it is in small bowel obstruction.

Due to the fact that vomiting occurs so early and often in mechanical obstruction of the small bowel it is understandable why distention usually occurs late. However, in mechanical obstruction of the lower ileum it is possible for distention to occur fairly early. On the other hand, because the ileocecal valve and sphincter often do not permit regurgitation of consequence into the ileum, the colon rapidly becomes distended in large bowel obstruction.

There is little or no tenderness or rigidity in early simple obstruction except during the cramps. Continuous tenderness may occur in late simple obstructions. In strangulating obstructions there is tenderness between the cramps with accentuation of the tenderness during the cramps, and the pains are usually more severe than in simple obstructions. Whether persistent tenderness is or is not present may be a helpful point in the differential diagnosis between simple and strangulating obstructions.

Early in mechanical obstruction there may be no increase of temperature or in the pulse rate but in late cases there may be fever and the pulse rate is increased, with symptoms of dehydration, intoxication and probably symptoms of peritonitis. In strangulating obstructions the seriousness of the condition usually becomes apparent much earlier than in simple obstructions. Whenever a mass develops, the obstruction probably should be considered of the strangulating type. Shock may occur in late strangulating obstructions, particularly when a long loop of bowel is involved, but it also depends upon the blood loss and extent of the intoxication.

Although it is true that constipation may be a prominent symptom of mechanical intestinal obstruction, it should be emphasized that the bowel below the obstruction is acting essentially normal; and for that reason the patient may have one or more stools with complete obstruction. It is possible for the patient to have diarrhea with partial mechanical intestinal obstruction and show fluid levels on x-ray examination.

Distention is likely to occur in the chronic types of obstruction, and visible peristalsis is often present. The bowel has usually become thickened when visible peristalsis occurs. This condition ordinarily does not occur in acute obstructions unless the abdominal wall is unusually thin.

Distention is a prominent finding in paralytic

ileus and may become marked if measures of decompression are not promptly employed. The pains are continuous; and when cramps do occur, they are not severe. Vomiting often occurs early but it is not as marked as in mechanical obstruction of the small bowel. In pronounced paralytic ileus the abdomen is silent on auscultation but in cases of lesser degree an occasional sound may be heard. There is some generalized tenderness in paralytic ileus but it is not marked unless peritonitis is present.

The symptoms of spastic obstruction closely resemble those of mechanical obstruction, particularly those of mechanical obstruction of the colon. Intestinal colic with distention is frequently present. Vomiting is not a prominent symptom, and when it does occur, it is usually late.

Although some cases of vascular obstructions have been reported as running a rather mild course for several days, most of the patients when first seen by the surgeon present a picture of an acute surgical condition of the abdomen. There is a history of abdominal pains and cramps with vomiting. The vomitus may contain blood. The abdomen is usually distended and there is often considerable tenderness and rigidity. Slight diarrhea is often present and blood may have been passed in the stools. The patients frequently present symptoms of peritonitis. If the patient presents a history of a probable source for an embolus or has a condition which may cause mesenteric venous thrombosis, the diagnosis of vascular obstruction certainly should be considered. This diagnosis has been made preoperatively in only a small percentage of the cases reported; but when a patient presents the symptoms and findings as heretofore described, we should consider the possibility of vascular obstruction. It is our experience that the patient with vascular obstruction presents a more serious condition in a shorter period of time than one with obstruction from a neoplasm.

DIAGNOSIS

X-ray examination is the most valuable of all aids in the diagnosis of intestinal obstruction and therefore should never be omitted in suspected cases. Gas ordinarily is not observed on the roentgen film of the small bowel after the third year of life, and for gas to be visualized in the small intestine on the x-ray film it is necessary for stasis to exist. Usually the stasis must exist four hours or longer before the gas can be demonstrated. To establish the diagnosis of mechanical intestinal obstruction it is not only necessary to demonstrate gas in the small bowel but also the bowel must be distended. There are a number of conditions by reflex action which may cause gas to occur in the small bowel, one of which would be kidney colic; as a rule, however, the bowel shows very little distention in those cases. In acute obstructions of the large bowel the distention is confined mainly to the colon and the distended bowel is usually at the lateral borders of the abdomen. It may also have the appearance of an inverted U. In small bowel obstructions the distended bowel is in a more central location and the loops are more or less transverse and may have a stepladder arrangement. Several years ago it was thought fluid levels established a diagnosis of complete mechanical obstruction of the small bowel, but with greater experience we have learned that fluid levels may be present and the patient only partially obstructed. In simple mechanical obstructions of the small bowel the valvulae conniventes show on the x-ray film. When there is interference with the circulation of the small bowel, the valvulae conniventes do not show on the roentgen film and the loops of bowel are not always transverse. In mesenteric thrombosis there are no definite diagnostic x-ray findings. When there is marked distention of both the large and small bowel, a diagnosis of paralytic ileus should be made; but at times only seg-

FIG. 1. Case 1. Incomplete obstruction of small bowel with fluid levels due to adhesion. Patient had diarrhea.

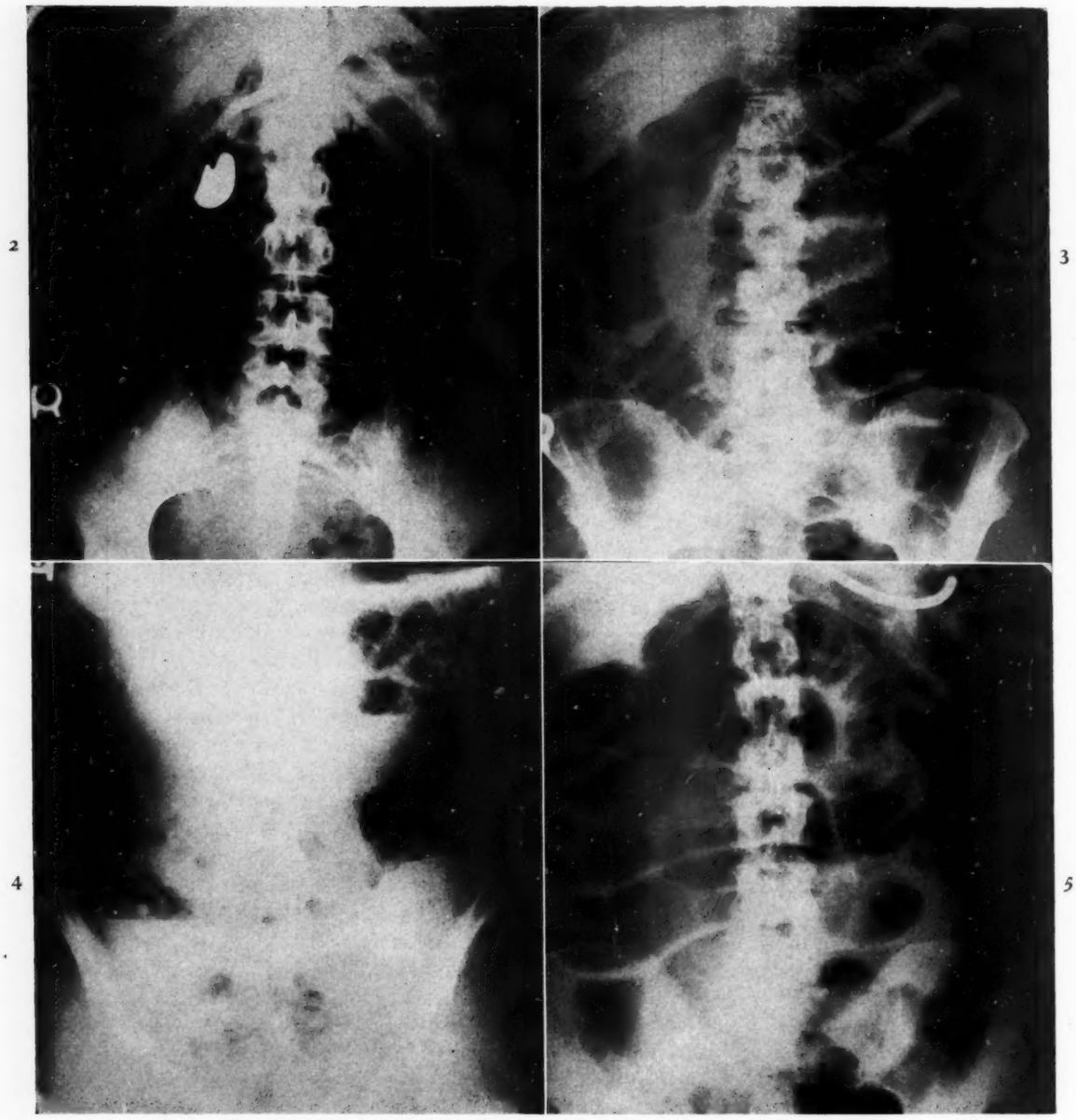

FIG. 2. Case II. Incomplete obstruction of small bowel due to adhesions.

FIG. 3. Case III. Complete obstruction of small bowel due to adhesions and partial malrotation of small bowel.

FIG. 4. Case III. Complete obstruction of small bowel with fluid levels due to adhesions.

FIG. 5. Case IV. Paralytic ileus, postoperatively.

ments of the bowel may be distended. (Figs. 1 to 5.)

In most cases the roentgenologist can differentiate between complete and incomplete obstructions, mechanical and paralytic obstructions, and obstructions of the large and small bowel. Giving barium orally is an extremely dangerous procedure in suspected cases of intestinal obstruction. A diagnosis of obstruction of the colon often can be made from a flat plate of the abdomen. At times there will be doubt about the diagnosis from the flat plate, in which event a barium enema may be given. However, the enema must be given under very low pressure as there is definite risk from this procedure. The pressure from the barium enema is greater than the intracolonic pressure in obstructions. Most roentgenologists can obtain all the information they desire from a film with the patient in the recumbent position;

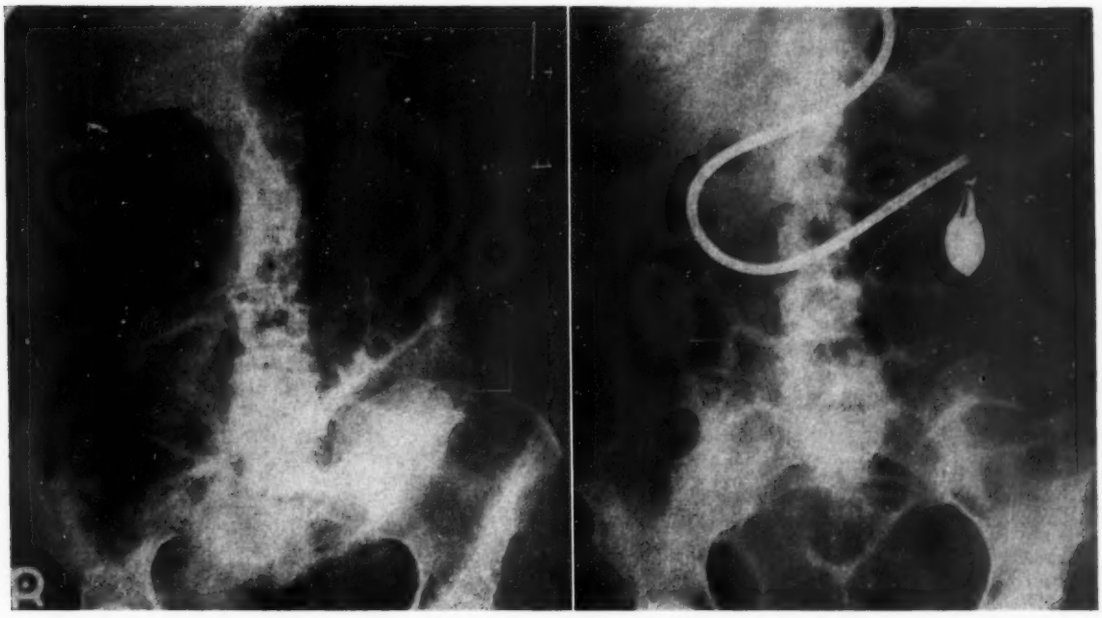

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FIG. 6. Case VII. Large bowel obstruction due to carcinoma of rectum.

FIG. 7. Case VIII. Paralytic ileus, postoperatively.

but when it is necessary for the surgeon to interpret the films, it is preferable to have films taken with the patient either upright or on his side in addition to the flat plate. The clinical findings and history must always be taken into consideration with the x-ray diagnosis as the films are occasionally difficult to interpret.

The diagnosis of mechanical intestinal obstruction may at times be difficult, but there are certain signs and symptoms which if well understood and looked for are of invaluable diagnostic aid. The three most important are history of recurring abdominal cramps of short duration, establishment of a diagnosis of intestinal colic and the finding of distended bowel on x-ray examination.

Mechanical obstructions are always accompanied with intestinal colic. It is necessary to auscultate the abdomen while the patient is having cramps in order to determine if there is increased peristaltic activity at the height of the pain. In milder cases there may be long intervals between the cramps and for that reason the auscultation of the abdomen must be continued until the cramps recur. When the diagnosis of intestinal colic has been determined, it should be considered as due to mechanical intestinal obstruction until the diagnosis has been confirmed or ruled out. If there is no tenderness or discomfort between the cramps, it is reasonable to assume the obstruction is of the simple type. If the abdomen remains tender and rigid with discomfort between the cramps, the obstruction should be considered of the strangulating type. It should be remembered that the patient with small bowel obstruction vomits early but distention occurs late or moderately late. The reverse is true in large bowel obstruction in that distention occurs early and if there is vomiting it is usually late. *When a patient is distended and has intestinal colic but has not vomited, we should think of obstruction of the large bowel.* Rectal examination may give the surgeon important information, hence should never be omitted. Many cancers of the rectum can be felt on digital examination. If obstruction of the upper rectum and lower sigmoid is a possibility, proctoscopic or sigmoidoscopic examinations are essential.

X-ray examination should be performed in all cases of suspected intestinal obstruction. In some cases pains recur at long intervals and the physician may not think the condition is of a serious nature. However, in such a case he will occasionally be surprised to find that x-ray examination shows partial obstruction.

Paralytic obstructions are accompanied with considerable distention and the abdomen is

FIG. 8. Case x. Spastic constriction of sigmoid, Hirschsprung's disease.

silent or almost silent. X-ray examination and auscultation of the abdomen will establish the diagnosis in cases of paralytic ileus. (Figs. 6 to 8.)

The principal causes of delay in making a diagnosis are as follows: (1) delay of the patient in seeking prompt medical aid; (2) lack of physical findings except during the cramps in the early simple obstruction and the fact the patient does not appear particularly ill; (3) the fact that the patient may have had one or more stools or that results may have been obtained from enemas; (4) previously the patient may have been given an opiate relieving all cramps during the examination thereby preventing a diagnosis of intestinal colic; (5) failure to auscultate the abdomen; (6) failure to take a careful history; (7) delayed x-ray examinations.

ANESTHESIA

Spinal anesthesia will produce the desired relaxation and in the good risk patient is considered the anesthetic of choice. Pontocaine with glucose is excellent for spinal anesthesia as the height of the anesthesia can be controlled and it gives prolonged action. Some anesthesiologists prefer nupercaine with glucose instead. In poor risk patients gas-ether supplemented whenever necessary with local anesthesia is perhaps as satisfactory a combination as can be employed. Enterostomy can be performed under local anesthesia. It is most important that the stomach be kept empty during inhalation anesthesia.

MORTALITY

Reports in recent years show there has been a steady decline in the mortality rate of intestinal obstruction. This has been brought about by a number of things, for example, earlier recognition and institution of treatment, prompt replacement of fluids and electrolytes, the more general use of suction in both the conservative and surgical treatment and by the use of sulfonamides and antibiotics. Nevertheless, there are still many cases seen late which account for the majority of deaths. The death rate shows a steady increase with each hour of delay in instituting proper treatment. Metabolic disturbances, distention of the bowel, pooling of blood in the capillaries, loss of blood, perforation, gangrene and infection are the important contributory factors in the high mortality rate. Distention and infection are more important than intoxication in the cause of death. A further decline in the death rate can be brought about by the frequent presentation of this subject, so that general practitioners as well as surgeons will become better informed as to the diagnosis and treatment.

The mortality rate will always be high in late strangulating obstructions, obstructions of the large bowel due to malignancy, late paralytic obstructions accompanied with peritonitis, congenital atresias and mesenteric thrombosis unless the condition is recognized early and when only a small segment of the bowel is involved.

TREATMENT

There are two general methods of treatment, first, conservative decompression and, second, surgery. There are several measures which are used in conjunction with either conservative decompression or surgery which are extremely helpful and at times may be life saving. Saline, glucose, Hartmann's or Ringer's solutions, intravenous proteins, blood transfusions, sulfonamides and antibiotics may be used. Intravenous proteins should be given cautiously

when there is diminished kidney or liver function. Saline solution is very beneficial if there has been much loss of fluid and it is essential in the high obstructions. It should be given in the preoperative preparation and postoperative care. It is of invaluable aid in restoring kidney function. Its value is in improving the patient's general condition as it does not actually neutralize the toxins but neutralizes their effects.

Glucose is absolutely essential if there is acidosis or diminished urinary output; but whenever the patient is seen early, it should be given before these symptoms have occurred. Therefore, it is important to give both saline and glucose early, before the patients have become dehydrated and before marked chemical variations of the blood and urine have taken place. If the patient is dehydrated, an effort should be made to establish fluid balance before performing surgery. Dehydrated patients with obstruction withstand surgery poorly, particularly resection of the bowel. Frequent determinations of non-protein nitrogen, blood chlorides, serum proteins and CO_2 combining power of the blood are necessary for the intelligent management of the cases when employing suction.

Blood transfusion may be indicated in all types of obstructions but its greatest usefulness is in severe cases of strangulating obstructions and in mesenteric thrombosis where the blood loss may be important, in chronic obstructions, as there are often anemia and low serum proteins, in paralytic obstructions with peritonitis, in the more toxic cases and those in which patients are in or near shock.

When employing suction in the average-sized adult it will be necessary to give about 3,000 cc. of fluid daily. The urinary output should be at least 1,200 cc. daily. An accurate record of the intake and output must be kept. Some patients will lose considerably more fluid than others; therefore, it is necessary to determine the amount of parenteral fluid needed for each patient. If adequate fluids are given, a satisfactory urinary output will be maintained. A frequent mistake is to give intravenous fluids too rapidly. In addition to adequate fluids an effort should be made to maintain a normal serum protein level and we have found travamin a very satisfactory protein preparation. The daily administration of vitamins B complex and C is necessary. Vitamin K is often indicated when giving antibiotics. Oxygen will be indicated in the most serious cases. Whenever there is a potassium deficiency, it must be replaced.

Conservative Decompression. Types of conservative decompression are Wangensteen suction and suction with intubation of the intestines using the Cantor, Harris or Miller-Abbott tube. The new intestinal tube developed by Dr. John W. Devine, Jr., of Lynchburg, Virginia, appears to have some advantage over the other tubes but we have had no personal experience with it.

Wangensteen suction is adequate for most cases of paralytic ileus and for many of the milder cases of mechanical obstruction but intubation of the intestines using the Cantor tube has a considerable advantage over Wangensteen suction as it more adequately drains the bowel above the obstruction. It is frequently difficult or impossible to pass the Miller-Abbott tube if mercury is not placed into the balloon. The roentgenologist can usually pass the Miller-Abbott tube under fluoroscopic examination. If an adequate effort is made, it should be possible to pass the Cantor tube in from 90 to 95 per cent of the cases. Keeping the patient on the right side or having him walk a few minutes, if he is able, is helpful in passing the tube through the pylorus. Under the most favorable circumstances it requires several hours to pass the Cantor tube through the duodenum and while waiting for the tube to pass in mechanical obstruction the patient must be observed often in order to determine whether surgery is indicated.

When employing conservative decompression for the relief of mechanical obstruction the surgeon is assuming a great responsibility and he is also assuming that he understands the pathology well enough to believe that suction has an excellent chance to relieve the obstruction. It is absolutely essential to recheck the patient's condition by x-ray examination about every eight to twelve hours unless recovery is definitely assured. Conservative decompression must not be continued for a long period as the only method of treatment in mechanical obstruction when there is no evidence of improvement. When employing this technic in the treatment of mechanical obstruction there should be a decrease in the frequency and severity of the cramps and of distention

of the bowel as shown by x-ray examination. Recently a patient with mechanical obstruction of the small bowel stated she had only one cramp in the first twelve hours after beginning conservative decompression. Except for the fact that distention of the abdomen had not decreased she appeared to be making a satisfactory recovery but x-ray examination at the end of the first twelve hours showed still greater distention of the intestine. Immediate operation was advised; and although the obstruction was not complete, the adhesions which were causing the obstruction were so dense that conservative decompression would not have relieved the obstruction.

Conservative decompression is the treatment of choice in paralytic ileus. In addition to this prostigmin, turpentine stupes and so forth are often beneficial. It is essential that the suction apparatus be inspected often to be certain it is working well. The three-bottle type of suction is the most satisfactory type. The following cautions should be observed: Loss of fluids and electrolytes must be promptly replaced. The patient must be examined frequently when this technic is used in mechanical obstruction as the condition may change enough in a short period to demand prompt surgery. Opiates should be given cautiously as it is necessary to know if the patient is having cramps.

This treatment has its greatest field of usefulness in paralytic ileus, in incomplete mechanical obstructions where conservative decompression would be expected to correct the pathologic disorder and in conjunction with surgery. It may be employed for short periods with caution in certain selected cases of complete simple mechanical obstruction provided the patient is observed often and continues to show signs of improvement. Conservative decompression may be used as a diagnostic as well as a therapeutic agent. Dark bloody drainage in the suction tube may indicate strangulation but may also be the result of irritation from the tube. Contraindications to use of this treatment are (1) strangulating obstructions except in conjunction with surgery and (2) as the only treatment in mechanical obstructions of the colon.

Indications of successful conservative decompression are: (1) relief of distention; (2) relief of cramps; (3) in complete mechanical obstructions the reappearance of gas on the roentgen film below the obstruction; the distention of the bowel should also be relieved or considerably diminished; (4) the passage of gas and feces after none had been passed for several hours or longer; (5) a decrease of the amount of fluid obtained by suction; (6) with the discontinuance of suction there should be no return of discomfort or distention.

Operation. Surgery should be performed in all cases of strangulating obstructions, large bowel obstructions, cases of mesenteric thrombosis, most cases of complete simple mechanical obstructions and all cases of incomplete obstruction in which conservative decompression would not be expected to relieve the condition. In the event the patient is seen early and the diagnosis is made clinically before the x-ray findings are positive, operation should not be delayed unless the findings indicate the obstruction is of the simple type. Conservative decompression in conjunction with surgery is of invaluable aid.

The operative procedure will vary with the findings and condition of the patient. In most simple obstructions of the small bowel all that is necessary is the removal or release of the obstructing agent and continuation of suction until all distention has subsided. The raw areas of intestine resulting from freeing adhesions frequently cannot be corrected by the usual methods. For the small raw areas the Mayo procedure is of definite value and for the larger areas the Noble procedure is recommended. Exteriorization may occasionally be indicated in cases of gangrene of the bowel. There is only a rare indication for enterostomy when employing conservative decompression. In mechanical obstructions of the large bowel colostomy or cecostomy, depending upon the location, ordinarily should be routine. Colostomy is preferred to cecostomy as it drains the bowel more adequately. It should be employed whenever the location of the obstruction permits its use.

If primary resection is decided upon, an absolutely rigid aseptic technic should be followed. In suturing the intestines it is necessary to keep a certain distance from the edges with each stitch and to place the stitches the same distance apart because if these rules are not observed one will never be certain about the water-tightness of the suture line. By careful attention to detail and technic in suturing one should be able to make a water-tight closure. Of course, in performing resection it is essential

to resect enough of the proximal bowel so that one will be certain the bowel is viable for suturing. It is also necessary that enough fat be resected from the mesenteric border of the ends of the bowel so that one will be suturing intestine instead of fat when the anastomosis is made. Chromic catgut is satisfactory for the mucosal suture but in most instances a non-absorbable suture is preferable for the serosal suture. We have found cotton just as satisfactory as silk for intestinal suturing and it appears to cause even less reaction than silk in the abdominal wall. If a non-absorbable suture is used for the mucosal suture, the knot must be tied within the bowel. Enough time must be taken to carry out a careful and aseptic technic. Certainly there should be no waste of time, but it is a mistaken idea to think one cannot take enough time to assure a water-tight closure and to avoid soiling. If the patient will not stand a resection properly done, a less formidable procedure should be carried out. To be able to operate quickly and at the same time observe certain well defined principles of surgery, such as careful dissection, careful hemostasis and gentleness, is a highly skilled accomplishment. However, the surgeon should never attempt to hurry through an operation in a good risk patient. For the extra time spent in employing a careful technic the surgeon will be repaid with lower morbidity and mortality rates.

CONCLUSIONS

Intestinal obstruction presents one of the most difficult problems in abdominal surgery. Delay in instituting proper treatment is the chief cause for the high mortality rate.

Intestinal obstruction should be suspected in all patients with intestinal colic until the diagnosis is confirmed or ruled out. Auscultation of the abdomen is essential when the patient has abdominal cramps.

The surgeon should operate early in cases of strangulating obstructions and in obstructions of the colon.

X-ray examination is the most valuable of all aids in the diagnosis of intestinal obstruction and should never be omitted in suspected cases. Repeated x-ray examinations are essential for the intelligent management of cases when employing conservative decompression in mechanical obstructions.

Conservative decompression should be employed in most cases of intestinal obstructions. It is the treatment of choice in paralytic ileus and in many cases of incomplete mechanical obstructions. It reduces the need of an enterostomy and is often of invaluable aid in conjunction with surgery. When employing this treatment in complete simple mechanical obstruction much delay in operating ordinarily is not justifiable if the patient does not show improvement within a few hours.

Results may be obtained from enemas or the patient may have bowel movements and still be completely obstructed.

REFERENCES

AMENDOLA, F. H. Acute intestinal obstruction. *Ann. Surg.*, 101: 1250, 1935.

ABBOTT, W. O. and JOHNSTON, C. G. Intubation studies of the human small intestine. Non-surgical method of treating, localizing and diagnosing the nature of obstructive lesions. *Surg., Gynec. & Obst.*, 66: 691, 1938.

BADIA, P. D. Acute intussusception. *M. Times*, 70: 373, 1942.

BROOKSHER, W. R. The x-ray diagnosis of acute intestinal obstruction. *Internat. J. Med. Surg.*, 45: 416, 1932.

DONALDSON, J. K. Intestinal obstruction. *Arch. Surg.*, 35: 155, 1937.

DEVINE, J. W., JR. Personal communication.

DURST, H. and UTZSCHNEIDER, S. Contribution to the roentgenologic diagnosis of intestinal obstruction. *München. med. Wchnschr.*, 1: 597, 1932.

DAVID, W. E. Paralytic ileus cured with prostigmin. *Lancet*, 228: 1100, 1935.

FERGUSON, L. K. The Diagnosis and Treatment of the Acute Abdomen. The Bulletin, School of Medicine, University of Maryland. 36: 3, 1951.

FEY, A. and CUBBINS, W. R. Acute mechanical intestinal obstruction: mortality with and without enterostomies; based on a review of 241 cases from the records of the Cook County Hospital. *Surg., Gynec. & Obst.*, 60: 738, 1935.

GATCH, W. D. Fundamental considerations in the operative treatment of advanced intestinal obstruction with especial reference to the management of cases complicated by gangrene of the intestine. *Surgery*, 1: 896, 1937.

GINZBURG, L. Management of acute intestinal obstruction. *J. Mt. Sinai Hosp.*, 4: 308, 1937.

GREENE, E. I. and GREENE, J. M. The early diagnosis of acute intestinal obstruction. *Illinois M. J.*, 61: 506–509, 1932.

HARRIS, F. I. and GORDON, M. Intestinal intubation in small bowel distention and obstruction. *Surg., Gynec. & Obst.*, 86: 647–648, 1948.

HARRIS, F. L. Intestinal intubation in bowel obstruction. *Surg., Gynec. & Obst.*, 81: 671–678, 1945.

HEACOCK, C. H. Obstructive lesions of the small bowel. *Radiology*, 17: 119, 1931.

HEGGS, F. Continuous duodenal aspiration in paralytic ileus and intestinal obstruction. An improved technic. *Lancet*, 233: 1250, 1937.

HELMS, J. S. Intestinal obstruction in infants due to malrotation of the bowel associated with volvulus. *Am. J. Surg.*, 79: 603–606, 1950.

JOHNSTON, C. G. Decompression of the small bowel by intestinal tube drainage at site of obstruction. *J. Michigan M. Soc.*, 37: 623, 1938.

LEWIS, A. E. and LEFF, W. Gaseous distention of the latex bag in the use of the single lumen intestinal tube. *Surgery*, 24: 1014–1015, 1948.

LOCKWOOD, I. H., SMITH, A. B. and WALKER, J. W. Acute small intestine. *J. Internat. Coll. Surgeons*, 14: 1, 1950.

LUPTON, C. H. Intestinal obstruction. *Virginia M. Monthly*, 66: 610–620, 1939; The principles of surgical technic with comparison of results obtained with fine silk, fine chromic catgut and large catgut (chromic and plain). *Am. J. Surg.*, 57: 122–137, 1942; Principles of surgical technique with particular reference to the use of silk, *Am. J. Surg.*, 45: 309–315, 1939.

MAYO, C. W. and BLUNT, C. P. The surgical management of the complications of diverticulitis of the large intestine; analysis of 202 cases. *S. Clin. North America*, 30: 1005–1012, 1950.

MAYO, C. W. Carcinoma of the right (proximal) portion of the colon. *S. Clin. North America*, 27: 875–884, 1947; Surgical treatment of carcinoma of right part of colon. *Minnesota Med.*, 30: 1197–1201, 1947; Malignancy of the small intestine. *West. J. Surg.*, 48: 403–407, 1940.

MILLER, C. J. A study of 343 surgical cases of intestinal obstruction, *Ann. Surg.*, 89: 91, 1929.

MONACO, D. F. Management of bowel obstruction. *Southwestern Med.*, 22: 393, 1938.

MORTON, J. J. Factors determining the selection of operation of the small intestine. *Surgery*, 1: 848, 1937.

MOSS, W. and MCFETRIDGE, E. M. Acute intestinal obstruction: a comparative study of 511 cases, with special reference to the lowered mortality achieved by modern methods of therapy. *Ann. Surg.*, 100: 158, 1934.

NOBLE, T. B., JR. Acute peritonitis: treatment of pathologic process and its immediate aftermath: further experiences with plication. *J. Internat. Coll. Surgeons*, 14: 66–82, 1950.

ORR, T. G. The therapeutic management of intestinal obstruction. *Surgery*, 1: 838, 1937.

POOL, R. M. and PORTER, C. H. Intussusception due to inverted Meckel's diverticulum. *Am. J. Surg.*, 80: 368–370, 1950.

PUTNEY, C. W. Intestinal obstruction. *Virginia M. Monthly*, 78: 342–348, 1951.

RUNDLE, F. F. Intravenous pituitrin in post-operative ileus. *Brit. M. J.*, 3911: 1208, 1935.

SAWYER, K. C. Method for relieving irreducible intussusception. *Am. J. Surg.*, 80: 871–872, 1950.

SCHILLING, J. A., MCCOORD, A. B. and CLAUSEN, S. W. Potassium loss in experimental intestinal obstruction. *Surg., Gynec. & Obst.*, 92: 1–13, 1951.

SHEINFELD, W. Positional anomalies of the large intestine: their clinical significance. *J. Internat. Coll. of Surgeons*, 14: 5, 1950.

SOUTHAM, A. H. Treatment of ileus following operations. *Lancet*, 214: 41–42, 1928.

STARLINGER, F. The results during the past thirty years of treatment of acute mechanical intestinal obstruction in the Eiselberg Clinic. *Wien. klin. Wchnschr.*, 44: 1560–1562, 1931.

SCUDDER, J., ZWEMER, R. L. and WHIPPLE, A. O. Acute intestinal obstruction, evaluation of results in 2150 cases; with detailed studies of twenty-five showing potassium as a toxic factor. *Ann. Surg.*, 107: 161, 1938.

SOLIS-COHEN, L. and LEVINE, S. X-ray diagnosis of complete and partial acute intestinal obstruction. *Radiology*, 31: 8, 1938.

SWENSON, P. C. and HIBBARD, J. S. Roentgenographic manifestations of intestinal obstructions. *Arch. Surg.*, 25: 578, 1932.

THOREK, P. Intestinal obstruction. *Gen. Practitioner*, 2: 1, 1950. Abdominal auscultation. *Am. Pract.*, 1: 7, 1947.

TRICHERA, C. Causes of death in acute intestinal occlusion, *Ann. ital. di chir.*, 10: 682–696, 1931.

UZNANSKI, M. E. A new treatment for paralytic ileus. *Illinois. M. J.*, 70: 567, 1936.

VON HABERER, H. The disease picture of mixed ileus and its treatment. *Med. Klin.*, 4: 1218, 1938.

WANGENSTEEN, O. H. The Therapeutic Problem in Bowel Obstructions. Springfield, Illinois, 1937. Charles C Thomas, Publisher; Intestinal Obstruction, Christopher's Surgery, pp. 1197–1227. Philadelphia, 1936. W. B. Saunders Co.; Acute bowel obstruction: its recognition and management. *New England J. of Med.*, 219: 340, 1938; Rationalizing treatment in acute intestinal obstructions. *Surg., Gynec. & Obst.*, 64: 273, 1937; Elaboration of criteria upon which the early diagnosis of acute intestinal obstruction may be made, with special consideration of the value of x-ray evidence. *Radiology*, 17: 44, 1931.

WEST, J. P. and SCHETLIN, C. F. Acute mechanical obstruction of the small intestine. *Am. J. Surg.*, 79: 432–435, 1950.

WISE, R. A. The Miller-Abbott double lumen tube in intestinal obstruction. A preliminary report. *Am. J. Surg.*, 41: 412, 1938.

WORKMAN, E. and MILLER, G. G. A clinical review of two hundred forty-one cases of obstruction of the small bowel. *Canad. M. A. J.*, 30: 141, 1934.

Practical Surgical Suggestions

DEVICE FOR COLLECTING FLUIDS FROM ABDOMINAL DRAINAGE TUBES

RICHARD B. MAGEE, M.D.
Cleveland, Ohio

WHEN bile and other body fluids are collected from a tube inserted through the abdominal wall, the procedure should be carried out in such a way that dressings are kept dry, the amount of drainage can be measured and the patient can move around easily or get out of bed. Conventional methods employing the familiar bedside bottle are apt to be untidy, tend to restrict the patient's activity unnecessarily and impose extra work on hospital personnel.

The following requirements constitute an ideal method for collecting such fluids. In principle it should (1) form a water-tight connection with the indwelling drainage tube, (2) hold a reasonable amount of fluid, (3) be wear resistant, (4) form as small a bulk as possible beneath the clothing, (5) be comfortable in any position the patient may assume, (6) be easy to put on and take off, (7) be easy to cleanse and empty, and (8) be adjustable to various physiques.

To meet these requirements a collecting device has been designed in the form of a belt worn about the waist. It consists of three elements:

The first is a rubber tissue drain 11 by 2 by 33 inches with a capacity of 200 to 300 cc. The water-tight connection between the abdominal drainage tube and the rubber tissue drain is achieved by fastening a stiff rubber tube ¾ inch in diameter and 2 inches in length into the rubber tissue drain with rubber cement and heavy silk ties. Into this stiff rubber tubing is placed a metal or glass connector which, in turn, fits into the abdominal drainage tube. The open end of the rubber tissue drain is occluded with a rubber band. This is removed when it becomes necessary to empty the rubber tissue drain.

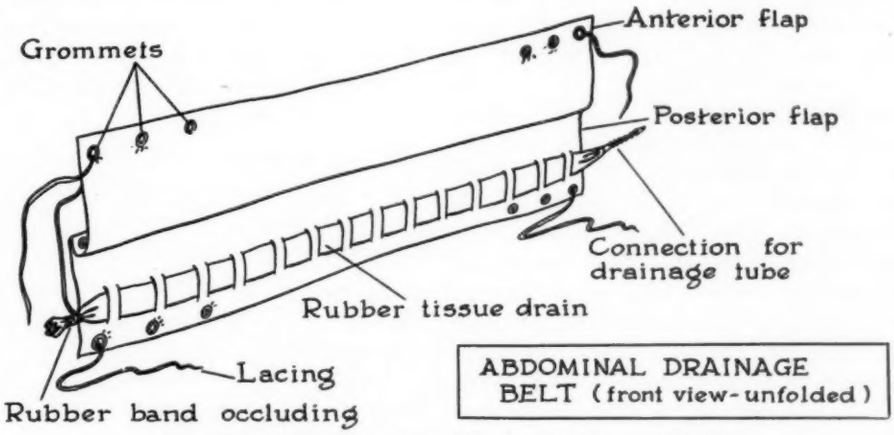

FIG. 1. Abdominal drainage belt (front view, unfolded).

A sturdy cloth belt 4 by 32 inches in the form of a long envelope forms the second element. One leaf holds the rubber tissue drain in a series of cloth loops. The other leaf folds over, covering the rubber drain.

The third element consists of the fastening mechanism. A series of metal grommets at either end of the cloth envelope are laced to-

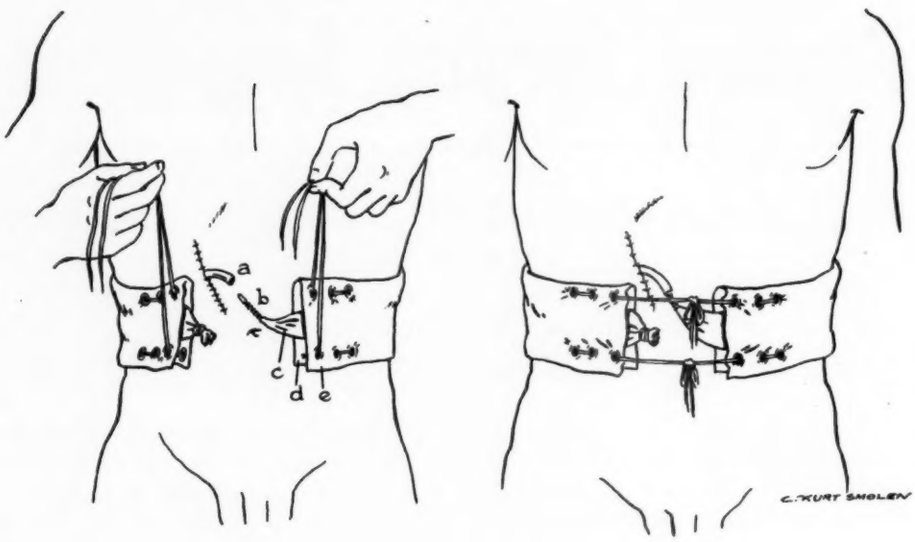

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FIG. 2. Abdominal drainage belt folded in position for wear. (*a*) abdominal drainage tube; (*b*) glass or metal connecting tube; (*c*) rubber tissue drain; (*d*) posterior flap holding rubber tissue drain; (*e*) anterior flap forming a protective cover over tissue drain.

FIG. 3. Abdominal drainage belt adjusted on patient. Note that lacings pass through the grommets of both anterior and posterior flaps.

gether at an appropriate level. This lacing provides accurate fitting of belt to patient while simultaneously holding the two leaves of the envelope together.

The fluid-collecting belt, in addition to the previously listed advantages, exhibits the following features: It eliminates the use of bedside bottles and long cumbersome connecting tubing for bed patients, thus providing increased comfort and reducing the nursing time involved in patient care. It facilitates freedom of motion in bed and early ambulation during the immediate postoperative period. Spillage is eliminated and soilage of bedding and clothing prevented. In addition, the device permits a more accurate determination of the amount of fluid drained in a given length of time. Upon discharge from the hospital patients may return to their normal occupations at once with a minimum of inconvenience, even if prolonged drainage is necessary. The tissue drain and the cloth belt can be separated for cleansing or replacement of one of the elements. The belt acts as an added support to both the underlying dressing and to the indwelling abdominal drainage tube. The contents of the belt may be drained simply by removing the rubber band; it is not necessary to remove the belt to empty it. The most satisfactory design is shown in Figures 1 and 2.

In conclusion a simple device for collecting body fluids from certain abdominal drainage tubes is described. The belt is neat, non-bulky and permits accurate measurement of fluid and unrestricted ambulation.

CONSTRUCTION AND CARE OF ABDOMINAL COLOSTOMY

GEORGE E. BINKLEY, M.B. (TOR.)
New York, New York

REHABILITATION of patients who have undergone extensive surgery for removal of cancer is an important phase of the cancer problem. The physical disabilities and mental anguish vary widely in a miscellaneous group. Anatomic deformities are influenced by location of the tumor, type of operation and extent of tissue removed. Ability to accept handicaps and deformities is influenced favorably by education and by the possession of a stable nervous system.

Adequate treatment of rectal cancer often necessitates the construction of an abdominal anus. In the early days many colostomies, because of poor construction and lack of proper care, were very disagreeable and it was not uncommon for patients to state that they would rather die than contend with the uncontrollable discharge of gas and feces. These unpleasant features of an abdominal anus have been greatly reduced in recent years. Today patients with well constructed openings have very little difficulty when they are taught a satisfactory technic of colon control. The majority are able, within a short time after operation, to follow gainful occupations and mingle with friends and associates without suspicion or recognition of the artificial condition.

In the early years colostomies were controlled by wearing rubber receptacles for the collection of feces. Control by colostomy bags was not satisfactory largely due to impregnation of the clothing with fecal odors. A very marked improvement in routine care was brought about by discarding the rubber receptacles and introducing daily colon irrigations. Further improvement occurred in the 1920's through the use of an apparatus that permitted irrigating without undue soiling. The closed method of irrigating has been employed routinely in our clinic at Memorial Center for twenty-five years. Irrigation, plus the occasional use of an easily cleansed plastic receptacle, has greatly reduced the physical and mental handicaps of the colostomy patient.

The problems involved with an abdominal colostomy may be conveniently discussed under three headings, namely, construction, routine care and treatment of complications and deformities occurring in the postoperative period. This article will deal chiefly with the features of the single-barrelled colostomy resulting from the Miles type of abdominoperineal resection.

Construction of the colostomy is of utmost importance. A poorly constructed opening seldom works well. Experience has proved that it is impossible to obtain sphincter control of gas and fecal discharge by means of abdominal muscles. Construction, therefore, should be directed at facilitating control by artificial means. The sigmoid colon is the ideal section of bowel for routine use. Other segments of colon are preferred under certain conditions. Adequate blood supply of the selected segment is essential. The angulation and mobility of the gut at the site of its posterior abdominal wall attachments should be such as to permit an upward flow of fluid into the left and transverse sections of the colon and for evacuation of solid and liquid feces without abdominal cramps or distress. A very acute angulation with fixation may cause a partial obstruction and prevent satisfactory irrigations. The abdominal location of the opening should lend itself to simplicity of routine care. It should be situated a sufficient distance from bony prominences and abdominal deformities to facilitate cleanliness, wearing a small dressing and an abdominal support.

We place the majority of openings in the midline between the umbilicus and the symphisis pubis. In all probability a very short distance above the symphisis pubis is the location of choice. The diameter of the channel or opening passing through the abdominal wall where the gut passes is important. Large

channels have a tendency to increase in size and often result in an incisional hernia about the gut. Small channels may cause varying degrees of intestinal obstruction. The diameter of the channel should be sufficient to admit the index finger into the lumen of the bowel without distress. A channel of this size usually results from a closure of the abdominal wound that will permit the insertion of two fingers along the side of the gut while the patient is under anesthesia. The diameter of the opening at the skin surface should be greater than the diameter at the level of the fascia and peritoneum. The distal end of the colon should protrude 3 to 5 cm. beyond the skin surface. Redundant bowel, beyond that required for a good anus, is excised before the patient leaves hospital after the edema has subsided. The abdominal wound is closed with buried alloy steel wire to avoid evisceration and hernias.

Rehabilitation begins on the first postoperative day or on the first day that the patient is aware of the colostomy. In most instances it is preferable not to discuss the features of a colostomy with a nervous patient prior to operation. Experience has shown that it is almost impossible at this time to present the true facts, and that a number of patients, because of misunderstanding, will delay or refuse operation. Efforts to lessen the immediate postoperative mental shock should not be undertaken lightly. The surgeon should devote sufficient time to explain in detail the necessity as well as the advantages of the operation and to emphasize that the ultimate annoyance and inconvenience will be very slight. The permanent inconvenience and mental handicap are only a small percentage of that anticipated by the patient in the early postoperative days. Sympathetic nurses and surgical house staffs trained in the care and education of these patients help a good deal in reducing the early postoperative mental shock and in encouraging patients to greater efforts in overcoming early apprehension. Patients with a stable mental outlook encounter little difficulty, while the emotional neurotic may require guidance, encouragement and moral support for weeks or months.

The ultimate acceptance of a colostomy depends largely upon the degree of inconvenience. Patients are most concerned in regard to their ability to control the discharge of feces and foul-smelling gas. At present there are two types of control which have proved fairly satisfactory: (1) Irrigation of the colon, whereby the colon is emptied at a convenient time. (An empty colon usually remains free of discharge, feces and gas, for periods of twenty-four to forty-eight hours.) (2) Receptacles for the collection of feces. (Only those that will not harbor fecal odors are advocated.)

Diet or restriction of a large number of foods is not considered a method of control. There are certain foods which are expected to have a laxative effect and another group that tends toward constipation, but unfortunately not all patients are influenced in the same manner or to the same degree. Because of this difference in the reaction to foods one cannot regulate colostomies by diet alone. The majority of our patients are able to eat the regular household menu with no ill effects. A small group may find that one or two types of foods have a tendency to create gas or influence bowel control.

Experience over many years with a miscellaneous group of patients and numerous varieties of technic and types of apparatus for controlling the colostomy leads one to believe that every patient should be taught in the early postoperative period how to irrigate his colostomy by both the open and closed technic. The majority of patients find irrigations the preferred method of control. A minority, after a fair trial of irrigating, may not be entirely satisfied and may wish to try wearing one of the numerous types of receptacles. Since temperaments differ widely, one should not expect every patient to be satisfied with the same routine.

Several types of apparatus for irrigating a colostomy have been described in the current literature since our report of a closed method in 1929. The principles of technic described at that time are still being used in our clinic, while the original apparatus has undergone a number of improvements. The improved paraphernalia of today includes a transparent lucite cup which fits snugly over the colostomy opening. The shape of the cup has changed very little during the years. In the center of the bowl is a small circular opening of sufficient size to permit the insertion of a No. 20 French catheter. The catheter and connecting tube carry the irrigating fluid from the can into the colon. One side of the cup is extended outward to form a projection arm. This projection arm

constitutes the outlet for the returning fluid and feces. A long soft rubber tube attached to the projection arm conveys the returning fluid to the toilet bowl or other suitable receptacle. The cup is held in position by means of a small belt or the patient's hand. The simplicity of this irrigating outfit, which prevents soiling and affords effective results, makes control of an artificial anus easy for the clumsy and inept as well as the intelligent patient. (Fig. 1.)

The importance of adequate instruction in irrigating before the patient leaves hospital cannot be overemphasized. Patients who understand the apparatus and technic encounter few difficulties on their return home. Patients who have not mastered the technic before leaving hospital may never discover the full virtue of this method. Education, when possible, should be in the hands of a sympathetic, experienced, interested nurse, who is familiar with the various features of the procedure, and who has learned that each patient presents an individual problem. When such a person is not available, education and instruction rests with the attending surgeon. This important phase of aftercare should never be assigned to an inexperienced nurse or an uninterested interne.

Irrigations are commenced on the seventh postoperative day. They are given daily while the patient remains in the hospital in order that the technic may be completely mastered before the patient is discharged. After leaving the hospital irrigations may be taken at intervals of one, two or three days. The interval finally selected is governed by the behavior of the colostomy and the general feeling of well being of the patient. The first few irrigations are given usually with the patient in bed. As a patient gains strength he is permitted to sit on a chair with arm rests; and a few days later may use the ordinary toilet seat. A smooth, hard board placed over the toilet seat is appreciated by the patient with a large perineal wound.

The initial irrigation consists of a pint of warm water or saline slowly instilled into the colon by means of a catheter and funnel. This procedure is repeated the next day, using 2 pints of fluid. On the third day the closed method is started. Sufficient fluid is employed with the first closed irrigation to produce a good evacuation. The nurse, during the next few irrigations, will be able to estimate to a rather accurate degree the amount of fluid necessary to obtain satisfactory cleansing of the colon. One patient may require as little as a pint of solution while others may need 1 or more gallons to obtain satisfactory results. The patient is encouraged at the second closed irrigation to insert the catheter and is instructed in controlling and regulating the rate of flow of fluid.

FIG. 1. Chair with arm rests for early irrigating routine. Irrigating apparatus in place; lucite cup over opening; inflow catheter in lumen of colostomy; large rubber rectal tube emptying into toilet bowl. Flow may be regulated by stopcock or height of can.

The tip of the catheter is inserted 4 to 6 inches or just a sufficient distance to afford an upward flow of the fluid. The rate of flow is regulated by the height of the irrigating can, by pinching the tubing and by a stopcock device. Cramps and abdominal distress will not occur during the irrigation if a satisfactory rate of in- and outflow of fluid is maintained. It is not always necessary to irrigate until the return flow is clean. The average irrigation is completed in less than one hour, without cramps or distress. To be successful the patient must remain free from expulsion of gas and

fecal material until the selected time of the next irrigation. Solutions for routine use may be tap water, sodium bicarbonate, normal saline and weak permanganate of potash. The majority of patients prefer tap water. A sluggish colon may be stimulated at the beginning of the irrigation by using one or more pints of a mild soap suds solution.

Prolonged drainage periods or expulsion of moderate amounts of fluid ten to fifteen minutes after the bulk of fluid has been expelled is encountered by a few patients. If these objectionable features are of frequent occurrence, the annoyance may be lessened by converting the irrigating apparatus into a temporary colostomy bag and wearing it to collect the discharge for fifteen to twenty minutes after expulsion of initial liquid feces has taken place. The irrigating apparatus can be readily converted into a temporary colostomy bag for such purposes by withdrawing the catheter and closing the small opening with a thumb screw and replacing the large waste-carrying tube with a soft rubber bag. Fortunately, postirrigation discharges occur in only a small percentage and can usually be overcome by improving the technic of irrigating.

The routine type of irrigating is satisfactory for the majority of patients with well constructed colostomies. There are, however, a few cases in which a modification of the ordinary technic is advisable. This modification is used to overcome prolonged irrigating periods and to prevent discharges of feces between irrigations. The aforementioned symptoms may occur early or late in the postoperative period. The causes of unsatisfactory routine irrigations include a dilated right and spastic left colon, narrowing of the opening, herniation about the gut, intestinal adhesions and metastatic disease within the abdomen. A satisfactory irrigation may be obtained by changing from the previously mentioned routine technic to an enema type washing of the colon. The enema type washing consists of instilling into the colon 1 or more quarts of fluid before any fluid is allowed to be expelled into the toilet bowl. This technic is similar to that of the ordinary enema. The amount of fluid necessary for a cleansing enema may vary from 1 pint to 2 or more quarts. The only additional equipment necessary for the enema technic is a small, solid rubber ball or the large nipple of a baby's nursing bottle.

The equipment for the enema is assembled and used in the following manner. A small hole is bored through the center of the solid rubber ball and a catheter is passed through this channel and the tip allowed to protrude a few inches beyond the circumference. The tip of the catheter is inserted into the colostomy opening while the other end is connected with a rubber tube from the irrigating can. The ball is held firmly against the surface of the colostomy until the required amount of fluid has passed into the colon. When a feeling of fullness is noted, the patient removes the ball and catheter and quickly places the irrigating cup over the opening. The use of the cup allows expulsion of the enema into the toilet bowl without undue soiling of the bathroom. One may substitute a large rubber nipple from a baby's nursing bottle for the rubber ball with equally good results in a large percentage of cases. The catheter, under these circumstances, is passed through the tip of the nipple and inserted into the colostomy opening and held in position by the patient until an adequate amount of fluid has entered the colon, then the operation is completed in the same manner as when the rubber ball is employed.

Receptacle care is considered a second-class method of controlling the average colostomy. Therefore, it should be tried only after the above technics of colon irrigating have failed. Rubber bags, because of the objectionable odor, should never be employed. In recent years a number of patients with colostomies, many of whom were never taught how to irrigate, have devised receptacles and placed them on the market. These receptacles are much more desirable than the old rubber bags. They are made of plastic or other material that is easily cleansed and will not harbor fecal odors. Some are fashioned in different shapes so as to fit comfortably against abdomens of various contours. Construction in a number of them is simple, while others are more complicated. It matters little to the surgeon what manner of toilet routine is finally adopted provided the patient is satisfied and enjoys the minimum degree of handicap.

The third phase of the colostomy problem is that of caring for complications in the postoperative years. Since many patients live

ten or more years after radical resection of the rectum for cancer, one may expect various complications or deformities to develop in the area of the opening. The three main complications or deformities encountered are (1) areas of hyperplasia on the external colostomy mucosa; (2) stenosis of the opening, and (3) hernias about the gut.

Areas of hyperplasia on the exposed mucosa may be large or small, simple or multiple. These elevated areas bleed readily to mild trauma. The frequent appearance of bright red blood is alarming to the average patient. Areas of hyperplasia occur most frequently in elderly patients and those in poor physical condition. Treatment for this condition consists of coagulation with an electric cautery. Anesthesia is not required for this minor operation.

Recurrent cancers or cancer implants are occasionally found on the surface of the gut or in the neighborhood of the artificial anus. Little difficulty should be encountered in making a differential diagnosis between hyperplasia and cancer in this location. Each case of cancer must be considered and treated in accordance with the clinical and pathologic factors. In some instances only a minor procedure is necessary while in others the patient should have the benefit of a major surgical operation.

Stricture or narrowing of the opening is a common complication, especially in poorly constructed colostomies. The narrowing may develop within a few months or not until many years after operation. It is usually at the skin surface but occasionally it occurs at the level of the fascia or in the wall of the bowel. When the bowel is involved, narrowing may extend from the level of the peritoneum to the tip of the gut. There are two types of stricture at the skin surface. One occurs when the bowel does not extend sufficiently above the external skin surface to prevent the skin from growing over that opening. The other type of stricture is found in cases in which the end of the bowel extends well above the upper layers of the skin. Strictures of this type occur when the skin surrounding the bowel becomes thickened and contracted producing a constricting band. Strictures at the level of the fascia and those involving the bowel wall are few in number. We have encountered only two of each variety in a large series of colostomy patients.

Strictures are often overlooked because the clinician fails to recognize the symptoms. These symptoms include varying types and degrees of distress within the abdomen, attacks of indigestion and loss of appetite. The control of the colostomy becomes more difficult, irrigating periods are prolonged and accidents or spills between irrigations are more frequent. The symptoms are often mistaken for those of peptic ulcer, gallbladder disease, adhesions, partial obstruction and intraperitoneal metastatic cancer.

Treatment of a strictured colostomy is a surgical problem. Forced dilatation with a finger or dilating instruments is contraindicated. Many years ago one of our patients died of peritonitis after mild dilatation with a finger. Daily insertion of the patient's finger and very mild stretching of the lumen may be of value in the early stages. Stricture at the skin surface requires a wide excision of adjacent skin, after which the bowel wall is sutured to the upper layers of the surrounding skin. Strictures at the level of the fascia are treated by excision of an adequate amount of surrounding fascia. The peritoneal cavity should be entered and the colostomy taken down when there is not sufficient length of gut to reach well above the skin surface, also when a large area of bowel wall is involved or when the stricture is complicated by a hernia.

Symptoms of hernia may simulate those of the ordinary abdominal incisional hernia or resemble those of a strictured opening. Treatment of hernias in the neighborhood of the artificial anus is a surgical problem. Large hernial sacs in the subcutaneous tissue with a small neck along the side of the gut are not uncommon. Treatment of hernias in this neighborhood is also a surgical problem. Conservative treatment may be employed in the early stages and when patients refuse operation. Surgical repair is similar to the repair of the average incisional hernia plus the handicap of dealing with a loop of gut in this location. At the time of operation the operator may find extensive adhesions to both large and small bowel when the peritoneal cavity is opened. At times hernias can be repaired leaving the colostomy at or near its original site; while in other instances it is advisable to transplant it to another location. Early recognition and proper repair of these complications are greatly appreciated by all patients.

AN OBLIQUE INCISION FOR EXCISION OF THE RIGHT COLON*

JOHN E. KESTERSON, M.D. AND ROBERT S. MCCLEERY, M.D.
Knoxville, Tennessee *Great Falls, Montana*

THE many advantages of the transverse incision for upper abdominal procedures have been discussed at length by Moschcowitz,[1] Gurd,[2] Bartlett and Bartlett,[3] Sloan,[4] Singleton,[5] Maylard[6] and Southam.[7] All have placed proper emphasis on the relatively transverse direction of the fibers of the muscles and fascia of the anterior abdominal wall. The purpose of this article is to describe a modification of the transverse incision, as presented by other authors, for use in excision of the right colon. One criticism of transverse incisions, in operations on the right colon, is the difficulty in visualizing and mobilizing the hepatic flexure and the ileocecal region. A purely transverse incision is too high for the ileocecal region and too low for the hepatic flexure. A long vertical incision allows one to get above and below these areas but lateral exposure is difficult. The oblique incision herein described enables the operator to see the hepatic flexure and to divide its attachments under direct vision and with minimal retraction. It seems to have the advantages of both and the disadvantages of neither. Furthermore, being primarily a muscle-splitting incision which follows the skin lines, it does not interfere with the nerve supply of the abdominal wall.

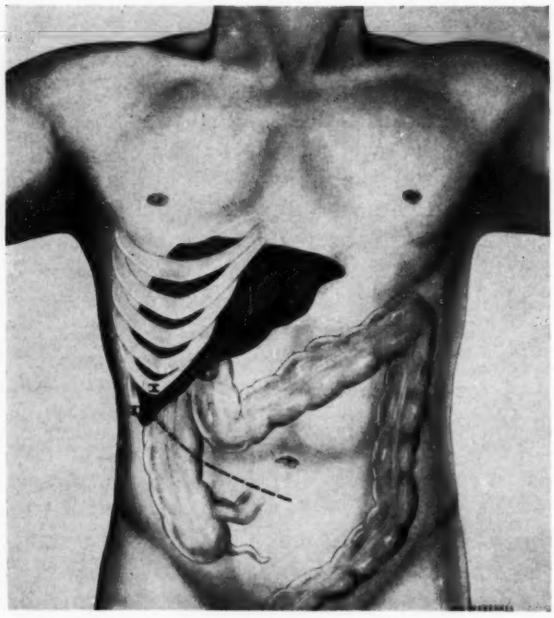


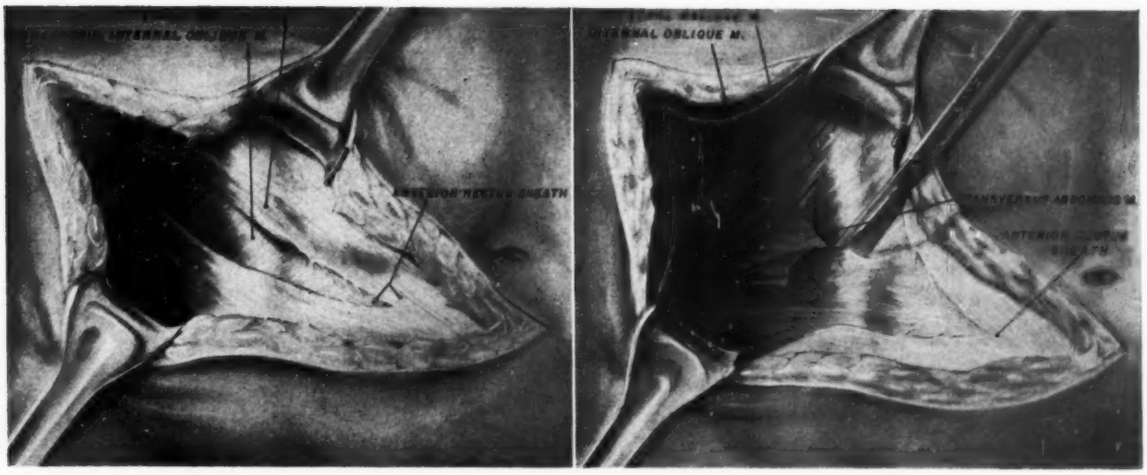
FIG. 1.

INCISION

The skin incision begins at the midline, two fingerbreadths below the umbilicus, and extends laterally and superiorly in a gently curving line to the area of the tenth interspace, just superior to the tip of the eleventh rib. The course of the tenth intercostal nerve is followed. (Fig. 1.) The external oblique muscle follows the line of the skin incision and is split in the line of its fibers. The aponeurosis of the muscle is cut obliquely as it blends into the anterior rectus sheath. (Fig. 2.) The portion of the anterior rectus sheath formed by the internal oblique aponeurosis is now seen. Beginning approximately 1½ inches lateral to the point where the incision crosses the rectus muscle, the internal oblique muscle is spread in the line of its fibers, from the lateral extent of the wound to the edge of the rectus muscle. Its aponeurosis and the anterior rectus sheath will be incised obliquely and it is thus necessary to cut across the intervening muscle fibers and fascia of the internal oblique muscle. (Fig. 3.)

In Figure 4 the incision in this layer is carried medially across the anterior rectus sheath to the linea alba. The internal oblique muscle is now widely separated from the

* From the Surgical Service, Thayer Veterans Administration Hospital, and the Department of Surgery, Vanderbilt University School of Medicine, Nashville, Tenn. Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.



FIGS. 2 and 3.

underlying transversus abdominis muscle and is retracted laterally. Maximum exposure of the hepatic flexure is made possible by transection of the small portion of the internal oblique fibers described previously.

The rectus abdominis muscle is divided and the transversus abdominis muscle separated and retracted as seen in Figures 5 and 6. At this point the tenth intercostal nerve is seen lying between the internal oblique and the transversus abdominis muscles as it enters the rectus sheath. It may be retracted gently, either superiorly or inferiorly. Figure 5 demonstrates clearly the formation of the anterior sheath from the aponeurosis of the external oblique and the anterior leaf of the internal oblique aponeurosis. Discernible also is the formation of the posterior sheath from the aponeurosis of the transversus abdominis muscle and the posterior portion of the internal oblique aponeurosis. The transversalis fascia and peritoneum are then incised in the line indicated in Figures 6 and 7.

CLOSURE OF THE INCISION

Anatomic re-approximation is begun by closing the peritoneum and transversalis fascia with interrupted No. 000 cotton sutures. The fascia and aponeuroses of the muscles and the rectus sheath are closed similarly in layers with interrupted cotton sutures.

COMMENTS

Except for the rectus muscle all of the fibers of the muscular and aponeurotic structures

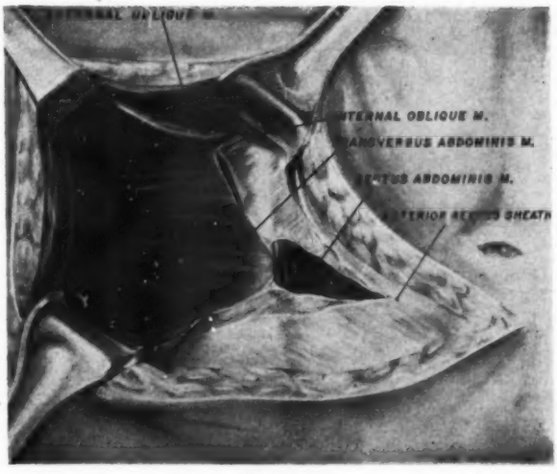
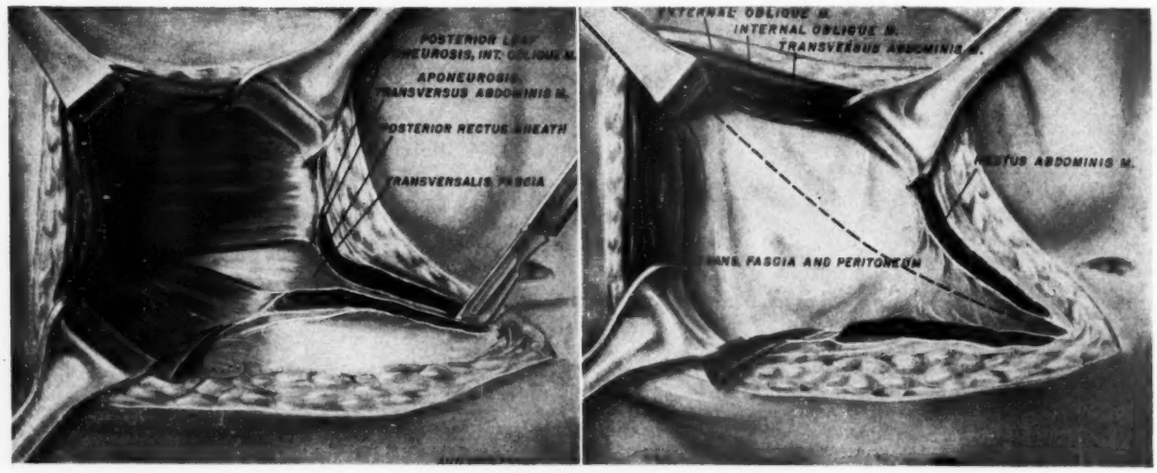


FIG. 4.

of the anterior abdominal wall follow a transverse or oblique course. It is for this reason that transverse or oblique incisions are more "physiologic," attended by less postoperative pain, and produce fewer wound disruptions.

The accompanying figures show that the incision is primarily a muscle-splitting, "physiologic" incision. It parallels the tenth intercostal nerve and nerve injury can be prevented. The incision heals well and with little discomfort, producing a strong abdominal wall. Transverse incisions used for excision of the right colon necessitate strong retraction both superiorly and inferiorly in order to visualize the two extremes of the wound. The widely employed, long vertical incision seeks to solve this problem but destroys nerves, cuts the rectus sheaths across their transverse



FIGS. 5 and 6.

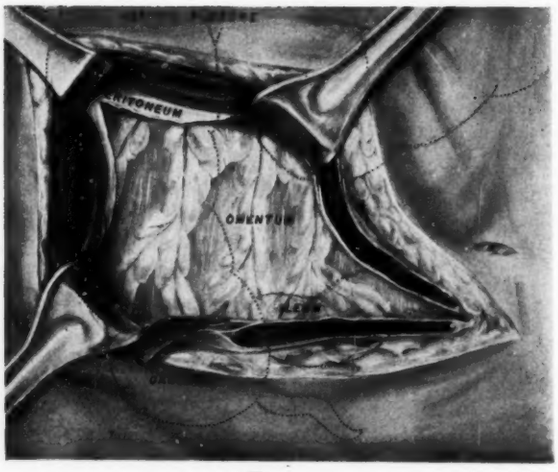


FIG. 7.

lines of stress and gives very poor exposure to the paracolic area of the ascending colon.

Although the incision has been used primarily to gain access to the right colon, it may be used in surgical procedures on the descending colon and proximal sigmoid colon. We have not used this incision in operations on the splenic flexure of the colon but have preferred a modified subcostal incision.

CONCLUSION

An oblique, predominantly muscle-splitting incision is described which gives excellent exposure of the right colon, hepatic flexure and ileocecal region. It accomplishes this with a minimum of anatomic destruction, and its closure is accompanied with minimal postoperative discomfort and complications.

Acknowledgment: The authors wish to express their appreciation to Miss Ann Marshall and Mr. Homer Jones for the accompanying illustrations.

REFERENCES

1. MOSCHCOWITZ, A. V. Transverse incisions in the upper abdomen. *Ann. Surg.*, 64: 268, 1916.
2. GURD, F. G. Anatomic principles involved in abdominal incisions. *S. Clin. North America*, 25: 271–284, 1945.
3. BARTLETT, W. and BARTLETT, W., JR. The transverse incision in the upper abdomen. *Surg., Gynec. & Obst.*, 57: 93–99, 1933.
4. SLOAN, G. A. A new upper abdominal incision. *Surg., Gynec. & Obst.*, 45: 678, 1927.
5. SINGLETON, A. O. Surgical wounds of the abdominal wall with their favorable and unfavorable results. *Am. J. Surg.*, 73: 233–247, 1947.
6. MAYLARD, A. E. Direction of abdominal incisions. *Brit. M. J.*, 2: 895, 1907.
7. SOUTHAM, A. H. A comparative study of abdominal incisions. *Brit. M. J.*, 1: 513, 1924.

AMBULATORY STUMP TRACTION

TIMOTHY A. LAMPHIER, M.D. AND ROBERT V. CONDON, M.D.
Boston, Massachusetts

MODERN antisepsis has made closed amputation practicable in most instances. The clinical advantages of this type of amputation are well known. However, there are certain conditions which demand open amputation. These are sepsis, impairment of circulation, necrosis of tissue at the level of amputation and other states in which healing by primary intention is questionable. In any great catastrophe in which casualties would tend to be numerous and antiseptic hospital facilities inadequate, open amputation would most certainly be the procedure of choice. In the presence of thermal burns and irradiated tissue with their attendant characteristic poor healing, open amputation would be used.

In this article we shall describe an ambulatory stump traction device which should prove of benefit in cases of open amputation.

We have devised an apparatus which can be applied simply and allows the patient to be ambulatory. By adjusting a turnbuckle daily the proper degree of tension can be maintained at all times. The apparatus is light and not cumbersome. It can be applied or removed in a matter of minutes. Wound dressing can be changed as frequently as desired without losing the advantage of constant traction. In like fashion stump wounds can be observed without removing the apparatus.

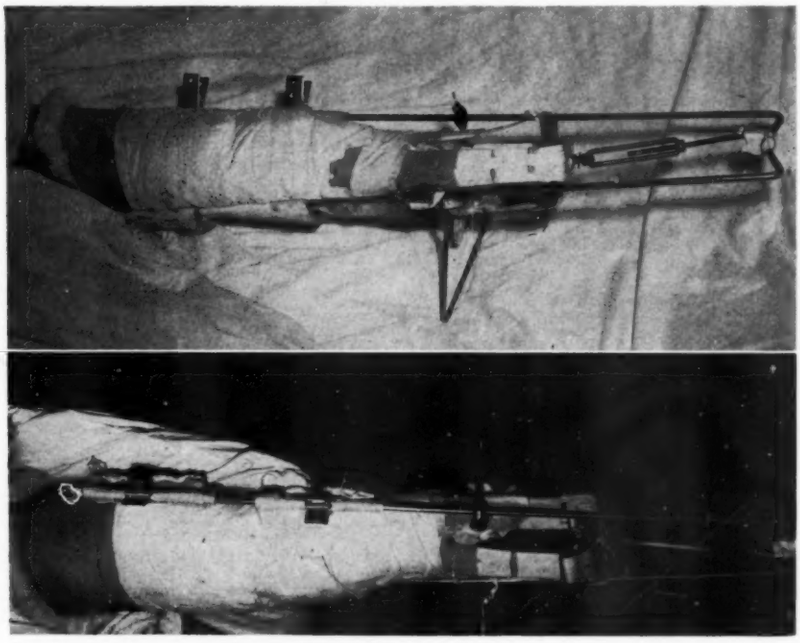


FIG. 1.

Figure 1 illustrates a traction apparatus that was applied to a mid-thigh stump following surgery. The apparatus consists of the following: (1) A half length Thomas splint; (2) the Thomas ring well padded with sheet wadding and/or felt to avoid pressure "sores" of the perineum; (3) four Buck's extension straps firmly secured to the anterior, posterior, medial and lateral skin surfaces of the stump after the skin has been well prepared with tincture of benzoin; (4) anchoring of the Buck's extension straps with long spiral adhesive straps to avoid impairment of circulation of the stump; (5) ace or flannel bandage to secure the strapping more securely (elastoplast may be used in those

instances in which there is no impairment of circulation); (6) two 4-inch wood spreaders which are crossed at right angles and to which are fixed the four Buck's straps by means of staples; (7) a 5-inch "turn-buckle" with a swivel and two washers (which is secured to the distal end of the Thomas splint); (8) a posterior "rest" consisting of two 6-inch web straps, held in place by easily adjustable clamps; and (9) a heel rest to be used when the patient is in a recumbent position for maintenance of elevation (held in place with serrated Zimmer clamps).

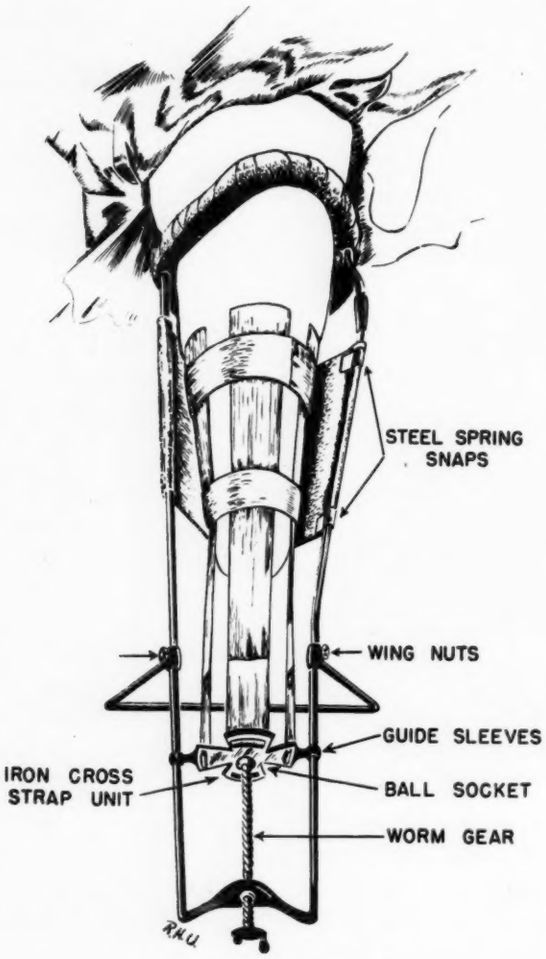


FIG. 2. Iron cross cradle.

We have devised with Mr. Robert Ulrich, our medical artist, a compact unit (Fig. 2) which can be more easily applied than the one we have already used.

The unit has been designed to keep the amputated leg firmly encased in an aluminum or iron cross cradle preventing movement in any direction. It is made possible by the guide sleeves on the extended cross units which keep the cross from rotating. The straps remain secure.

The unit is adjusted to the leg by turning the cross about half way up the shaft. The tape is applied to the leg and brought through the double slits in the cross, turned back and adhered to itself. The handle at the base is then twisted to make sure the unit is taut.

A sling is placed under the uppor portion of the leg and held in place by stainless steel snaps which are devoid of any sharp corners. The worm gear is attached to the cross by a ball socket.

This complete device should eliminate the old type unit consisting of a number of odd pieces which had to be put together causing discomfort to the patient. A one-piece unit also eliminates the risk of lost parts or improper adjustment.

An aluminum half strength Thomas splint would make the apparatus extremely light and less unwieldy.

The advantages of being ambulatory following amputation cannot be overestimated. The mental depression which frequently accompanies the loss of limb is often greatly intensified by long periods of immobilization. Traction is necessary to prevent retraction of muscle groups and to insure proper healing of muscle, fascia and skin edges, and thus result in a sound weight-bearing surface. The usual type of traction requires absolute bed rest.

In the event of mass disaster the desirability of ambulation would be unquestionable. Amputees would be free to evacuate devastated areas and hospital beds would be made more readily available to others in need of treatment. The limited facilities available would make such a procedure mandatory.

Case Reports

THE MANAGEMENT OF INJURIES TO THE EXTRAPERITONEAL PART OF THE RECTUM*

WITH REFERENCE TO THE USE OF STREPTOKINASE AND STREPTODORNASE AND AIR-VENT SUCTION

JOSEPH M. MILLER, M.D. AND PERRIN H. LONG, M.D.

Fort Howard, Maryland *Brooklyn, New York*

A DIFFICULT surgical approach and a retroperitoneal area extremely vulnerable to infection have made the morbidity and mortality associated with injuries to the infraperitoneal part of the rectum extremely high. A chronic and severe infection is associated with extension of the infection from the infraperitoneal space to the retroperitoneal area. The experience of surgeons in World War II led to a standard order of procedure of operation as soon as possible, the creation of a diverting colostomy, suture of the perforation, if possible, provision of adequate drainage of the retroperitoneal and infraperitoneal spaces with or without coccygectomy, replacement of blood and appropriate chemotherapy. With this routine an improvement in results was noted.

In many instances, however, drainage continued for protracted periods and the formation of secondary abscesses was not uncommon. Spontaneous drainage along previously placed Penrose drains was poor. A significant contribution to therapy would be made, therefore, if gross suppuration could be prevented or if gross collections of pus could be removed and prevented from reforming. The introduction of treatment with streptokinase and streptodornase and the use of air-vent suction drainage permits a closer approach to this ideal, particularly since the enzymes make pus thin which is then removed by suction. Healing in infected wounds and hematomas is considerably enhanced by the removal of fibrin and desoxyribose nucleoprotein which form large parts of the solid material in pus. These substances inhibit normal reparative processes.

Phagocytosis of bacteria by motile leukocytes is one of the fundamental steps in healing. Leukocytes are clumped and rendered inactive by desoxyribose nucleic acid, one of the products of digestion of desoxyribose nucleoprotein.

Tillett and Sherry,[3] studying the white blood cells of purulent exudates in empyema of long-standing, found that such masses of leukocytes were broken up when streptodornase was introduced. Johnson[1] reported that such clumping was not seen in the absence of extracellular desoxyribose nucleic acid. He believed that the clumping was probably associated with the high viscosity of extracellular desoxyribose nucleic acid which was digested by streptodornase. Thus, by the digestion of this complex nucleic acid, fresh leukocytes coming into the infected area were not inactivated. In addition, the rate of degeneration of white blood cells was considerably less where exposure to enzymes had occurred as contrasted to untreated controls.

Johnson[1] has also reported an increase in the total number of white blood cells in the wound due to an influx of fresh viable cells when streptokinase and streptodornase were injected into the wound. A rapid rise in the number of supravital staining, motile, phagocyting leukocytes was noted. The cells observed in response to the injection of streptokinase and streptodornase were largely those of the polymorphonuclear neutrophilic series. The nuclei, as well as other evidence of living cells, was not affected by the compounds.

* Reviewed in the Veterans Aministration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

The digestion of fibrin, according to Johnson, although not significant in the clumping of leukocytes is important in the treatment of hematomas. Lysis of fibrin occurs by the action of a fibrin-lysing system in the euglobulin fraction of the blood which is activated by streptokinase. The coagulated blood is liquified and aspirated easily.

Three advantages are derived from the use of streptokinase and streptodornase in the treatment of an infected hematoma such as is associated with injury to the infraperitoneal portion of the rectum. The clotted blood, which is an ideal culture medium for bacteria, is liquified through the action of streptokinase. Phagocytosis is enhanced by streptodornase. The total number of viable leukocytes in the infected area is increased by streptokinase and streptodornase.

An adequate means for removal of the liquified blood clot, fibrin, and the products of digestion of desoxyribose nucleoprotein and desoxyribose nucleic acid must be provided. Ideally, the wound should be left open to provide adequate drainage. This cannot be done in wounds about important viscera. The compromise of closing the wound and placing Penrose drains into the depths is usually called adequate drainage. Such, however, is not the case since pools of pus frequently accumulate at the base of these drains or spread into adjacent areas. Drainage by Penrose drain is dependent upon capillary action. It is difficult for pus to run uphill. This fact has been recognized by some surgeons who put patients on their faces to promote drainage from the abdomen.

Drainage as it is commonly used, however, actually is inadequate drainage leaving a dead space to encourage infection. Adequate drainage will be provided by air-vent suction using two No. 20 French urethral catheters, one to serve as an inlet for air and the other as an outlet for pus, connected to a Stedman pump providing negative pressure of −6 to −8 cm. of water. Adequate drainage promotes the removal of pus and encourages apposition of the walls of the infected space. Such drainage can be made more effective by the use of streptokinase and streptodornase since these compounds make thick pus thin. The catheters permit the enzymes to be introduced into the depths of the wound postoperatively when their action is needed. Suction is discontinued for a period of four hours while digestion induced by streptokinase and streptodornase proceeds. Suction to aspirate the products of digestion and to keep the wound dry is then re-established until the time for the next treatment.

The continuous removal of pus producing a dry wound permits better healing at the line of suture of the laceration of the rectum, for a suture line which is bathed in purulent material usually breaks down. The incidence of osteomyelitis of the coccyx, if it has not been removed, or of the sacrum in wounds of the infraperitoneal part of the rectum should be reduced by the program outlined.

A lateral incision or one over the coccyx may be used to enter the infraperitoneal space but the anal sphincter should not be injured. Exposure is gained and speed in entering the space is lost when the lateral incision is employed. Time used to complete the operation, however, actually is saved by the good exposure afforded by the lateral approach. The type of incision employed, as long as it provides the necessary exposure, will not decrease the possibility or severity of retroperitoneal infection.

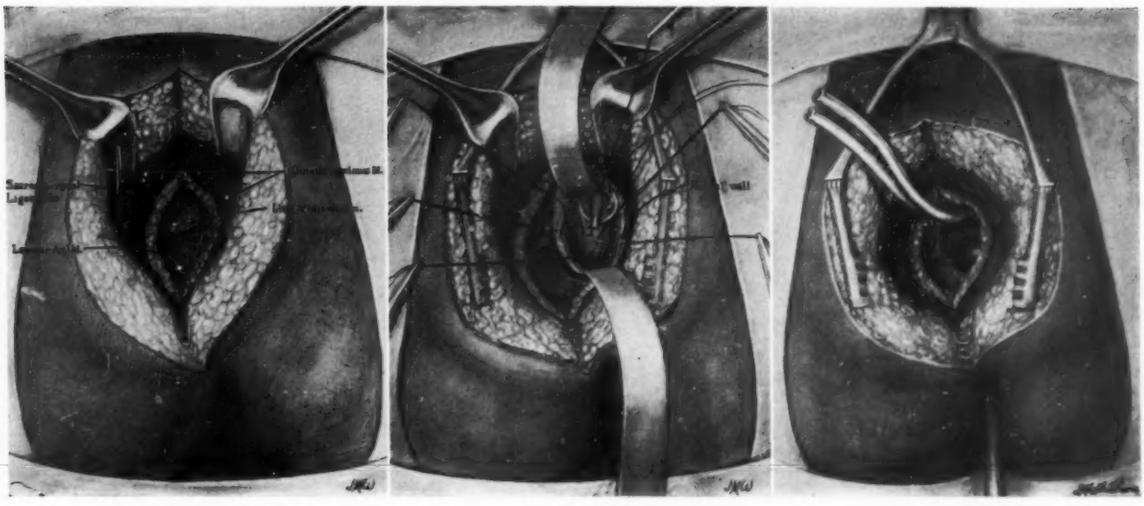
When the perineal part of the operation has been completed, a rectal tube of large caliber should be passed proximally to the repaired laceration and then securely sutured to the skin about the anus. Pressure by flatus on the line of suture can be materially decreased by this maneuver.

The principles enumerated are applicable to any infected wound. The results of treatment with streptokinase and streptodornase in infections of soft tissue have been uniformly excellent and have been reported elsewhere.[2] It was but natural that the treatment outlined should be used on the patient whose detailed history follows:

CASE REPORT

G. U. W., a twenty-five year old Negro, was admitted to the Veterans Administration Hospital at about 6:00 A.M. on March 1, 1951, having been shot in the back, both upper arms and the left hip by a 0.38 caliber gun at about 10:00 P.M. on February 28, 1951. He had been admitted almost immediately after injury to another hospital where tetanus antitoxin and gas gangrene antitoxin had been given. He was subsequently transferred to this hospital for further treatment.

The patient was in good general condition with blood pressure of 110/70. Multiple super-



1 2 3

FIG. 1. Operative approach to rectum through a left lateral incision.

FIG. 2. Transrectal repair of the laceration in the anterior wall of the rectum.

FIG. 3. The wound showing the two No. 20 French rubber urethral catheters for air-vent suction coming from the upper part and the No. 30 French rectal tube coming from the rectum.

ficial wounds were present in the back at the level of the twelfth thoracic vertebra. A moderate degree of tenderness and rigidity were present in the lower abdomen. A large amount of clotted blood was present in the rectum. Penetrating wounds were present in both upper arms. A wound of entrance was present over the left hip and a bullet could be felt in the subcutaneous tissues of the right hip. Arterial and neural damage was not present.

Laparotomy performed about ten hours after injury through a lower midline incision did not reveal perforation of the gastrointestinal tract. An extensive hematoma had dissected retroperitoneally and into the mesosigmoid from the infraperitoneal space. A right transverse colostomy was established through a transverse incision over the upper part of the right rectus abdominis muscle. After closure of the lower midline incision the patient was turned to the prone position. An incision was made through the left gluteus maximus and levator ani muscles to expose the rectum. (Fig. 1.) A small portion of the coccyx was removed. It was now possible, with a finger in the rectum, to feel a perforation about 1.5 cm. long on the anterior wall about 2 cm. below the peritoneal reflection and about 7 cm. from the anal orifice. The posterior wall was free and to avoid further dissection a transrectal approach to the laceration was made. The posterior wall of the rectum was incised, and through this incision repair of the laceration in the anterior wall was effected. (Fig. 2.) The posterior wall was then closed. Two No. 20 French rubber urethral catheters were passed well up into the retroperitoneal space to provide drainage for the hematomas. The operative site was closed with the catheters being permitted to come out of the upper part. A No. 30 French rubber rectal tube was passed through the anus to a point proximal to the repaired laceration and then sutured to the skin about the anus. (Fig. 3.)

Débridement of the wounds of the back, arms and left hip was done. The bullet was removed from the subcutaneous tissues over the right hip and the wound left open.

The postoperative course was entirely uneventful. Air-vent suction of the retroperitoneal and infraperitoneal space provided through the previously inserted catheters was started after operation. When the suction was discontinued, 75,000 units of streptokinase and 25,000 units of streptodornase were placed into the retroperitoneal space daily from March 2nd to the 8th. After four hours the products of digestion were aspirated by re-establishing the suction until the time for the next treatment. The catheters were removed from the retroperitoneal space on March 9th. Streptokinase, 37,500 units, and 12,500 units of streptodornase were applied topically to the gluteal wound on March 15th and then the dose was reduced to 15,000 units and 5,000 units, respectively, from

FIG. 4. The wound on the left made for repair of the laceration of the rectum and the wound on the right made for removal of the bullet on May 9, 1951.

March 16th through April 2nd. Each of the remaining wounds was treated with 15,000 units of streptokinase and 5,000 units of streptodornase from March 4th through April 2nd. The patient received penicillin intramuscularly, aureomycin intravenously and orally, and sulfasuxidine by mouth and through the distal loop of the colostomy and rectum at different periods of his stay in the hospital.

The colostomy was opened on March 2nd. A liquid diet was started the next day and a low residue diet on March 9th. All wounds continued to heal well. Proctoscopic examination on March 13th revealed the laceration in the rectum to be intact and on a repeat examination on March 29th the laceration was healed.

Tetanus toxoid, 0.5 cc., was given intramuscularly on April 2nd. A Pauchet closure of the colostomy in the transverse part of the colon was done the following day. This wound and the wound at the site of drainage of the retroperitoneal and infraperitoneal spaces (Fig. 4) healed rapidly. A slight delay in the healing of the other wounds was noted but eventually they, too, healed. The patient was discharged from the hospital on April 27th.

The patient was seen last on May 9th. He was asymptomatic and having normal bowel movements.

COMMENT

The primary purpose of the surgeon in caring for patients with injury to the rectum is to save life. With newer methods of therapy morbidity and mortality can be decreased. Because of the high incidence of infection associated with wounds of the infraperitoneal portion of the rectum one cannot stress enough the importance of auxiliary measures designed to decrease wound infection and encourage primary healing of the rectal laceration and operative wound.

The period of hospitalization of patients with injuries similar to the one described averaged four to six months or longer in some instances in the Armed Forces during World War II. Many of these patients were never returned to full duty.

Admittedly, the present report concerns but one patient. The stay in the hospital was fifty-eight days. The opportunity to treat a patient with a similar injury may not occur for a prolonged period. Since the results obtained in other types of infected wounds with streptokinase and streptodornase combined with adequate drainage have been so good, this instance is reported with the hope of encouraging others to use the treatment advocated.

REFERENCES

1. JOHNSON, A. J. Cytological studies in association with local injections of streptokinase-streptodornase in patients. *J. Clin. Investigation*, 29: 1376–1386, 1950.
2. MILLER, J. M., GINSBERG, M., LIPIN, R. J. and LONG, P. H. Clinical experience with streptokinase and streptodornase. *J. A. M. A.*, 145: 620–624, 1951.
3. TILLET, W. S. and SHERRY, S. The effect in patients of streptococcal fibrinolysin (streptokinase) and streptococcal desoxyribonucleose on fibrinous, purulent, and sanguineous pleural exudations. *J. Clin. Investigation*, 28: 173–190, 1949.

SPONTANEOUS PATHOLOGIC FRACTURE OF THE CLAVICLE

V. Edward Caselnova, M.D.
Brooklyn, New York

MUCH has been written concerning spontaneous pathologic fracture of the skeletal system but little or nothing is reported about such occurrences in the clavicle. Two such cases admitted to the Victory Memorial Hospital within a period of about eight months are reported herein. As will be noted, the cases present several striking parallel features.

Records reveal two cases of spontaneous fracture of the clavicle but these were due to gumma and not to metastases from a focus of malignancy.

Geschickter and Copeland reported three cases of metastases to the clavicle from carcinomas of the breast in 100 cases but none as pathologic fractures. In another statistical list of thirty-seven cases of bone metastases they report eight clavicle involvements from undetermined primary malignant disease, but again not one is described as a spontaneous pathologic fracture. When hypernephroma or renal adenocarcinoma are concerned, no clavicle involvements are reported although metastases of these tumors are reported in the humerus, spine, femur, pelvis, ribs, bone of foot, skull and sternum, in this order of frequency. From hypernephroma they report pathologic fractures involving the humerus (three), ribs (one) and femur (six).

CASE REPORTS

Case 1. J. G., a sixty-three year old male, was admitted to the Victory Memorial Hospital on October 28, 1946. The patient complained of severe sharp pain in the right shoulder and a lump in the right axilla. He stated that for the past five to six weeks he felt mild pains in the right armpit and collar bone. At the same time he became aware of the lump. The day before admission the pain suddenly became very severe while the patient tried to reach for a glass of water.

Physical examination revealed blood pressure was 140/80. Thyroid was not enlarged. A mass about the size of a hen's egg was felt in the right axilla which was freely movable and quite tender. The mid-portion of the right clavicle was swollen and very tender to touch.

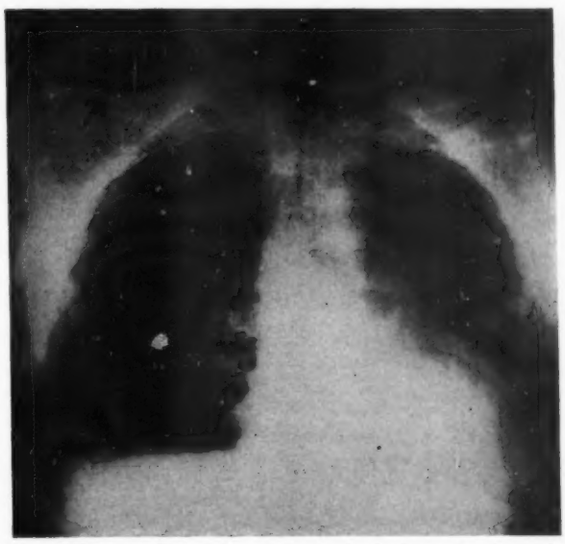


Fig. 1. Case 1. Spontaneous pathologic fracture through the middle third of right clavicle due to adenocarcinoma of right adrenal gland.

Lungs were negative; abdomen revealed no abnormalities; prostate was normal. The rectum was negative to proctoscopy.

Laboratory data revealed urinalysis was negative. Bence-Jones test with confirmatory tests were positive. Prostate smear was essentially negative. Serum phosphatase acid was 1.5 units corrected, alkaline 11.2.

Blood count was as follows: hemoglobin, 116 per cent; red blood cells, 6,000,000; white blood cells, 6,500; polymorphonuclears, 76 per cent; stabs, 2 per cent; lymphocytes, 8 per cent; monocytes, 11 per cent; eosinophils, 2 per cent; basophils, 1 per cent; platelets normal. There appeared to be a secondary erythrocytosis and a relative increase in monocytes and polymorphonuclears. The monocytosis suggested the possibility of malignancy. Wassermann test was negative.

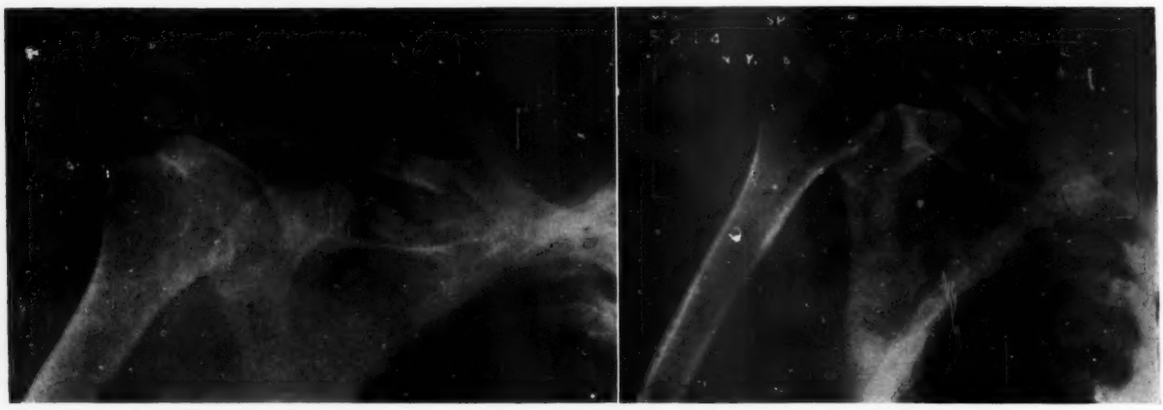


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FIG. 2. Case 1. Spontaneous pathologic fracture through the middle third of right clavicle due to adenocarcinoma of right adrenal gland.

FIG. 3. Case 1. Spontaneous pathologic fracture through the middle third of right clavicle due to adenocarcinoma of right adrenal gland three weeks later after treatment (immobilization and x-ray therapy).

FIG. 4. Case 11. Spontaneous pathologic fracture of outer third of left clavicle due to adenocarcinoma of right kidney.

X-rays of the clavicle showed a pathologic fracture in the middle third of the right clavicle in good position. (Figs. 1, 2 and 3.) There was an area of bone erosion at site of fracture. No evidence of gross pathologic disorder in the lung parenchyma existed. Skull, vertebrae, pelvis, femur and genitourinary tract were negative. Intravenous pyelograms and retrograde pyelograms were done.

At biopsy the mass in the right axilla was removed. Section consisted chiefly of tumor cells which were large. Cytoplasm was markedly vacuolated. Nuclei were large, granular and varied greatly in size and staining qualities. Mitotic figures were present. A striking feature was the arrangement of the cells in what appeared to be clumps giving a pseudo-alveolar structure. The lesion was probably metastatic, origin not determined at present, although adrenal, kidney and prostate were possibilities. Clear cell carcinoma of kidney was considered a possibility.

The patient was discharged from the hospital on November 21, 1946. On December 18, 1946, the patient died at his home.

At autopsy the outstanding findings were pigmentation of lower extremities; surgical scars on right anterior axillary folds; healing pathologic fracture right clavicle with neoplastic mass extending along fascia to right axilla; scattered miliary growths on pleuras; peritoneal implants, jejunum invaded by one mass extending into lumen; liver studded with soft tumor masses 1 to 7 mm. in diameter; right adrenal replaced by a tumor mass 7 cm. in diameter; numerous retroperitoneal glands.

The final diagnosis was adenocarcinoma of right adrenal gland with metastases.

CASE 11. C. B., a white fifty-three year old female, was admitted to the Victory Memorial Hospital on June 27, 1947, complaining of a sharp severe pain in the left shoulder and collar bone which came on about two weeks before while she was raising a window. At that time she was being treated by her physician for shingles.

Physical examination revealed neck rigid and painful on rotation, exquisite tenderness over the outer third of left clavicle and sharp pain on motion of left arm. A large mass was palpable in right kidney region.

Laboratory data were as follows: urinalysis negative, Bence-Jones test positive, red blood cells, 5,300,000, polymorphonuclears 68 per cent, lymphocytes 28 per cent, monocytes 4 per cent, Wassermann test negative, Rh positive—type A. Blood chemistry was non-protein nitrogen 23, creatinine 1.6, urea nitrogen 6.0, glucose 94, cholesterol 244 and total proteins 12.

X-rays of the ribs showed bone absorption and erosion of fifth rib on left and right sides. X-rays of the chest showed the lungs were clear. There was a pathologic fracture of the outer third left clavicle. (Fig. 4.) Intravenous pyelograms revealed good filling of calyces, pelvis and ureter on left side. There was poor filling in the lower calyces on the right side. The right kidney was markedly enlarged. The diagnosis was intramedullary tumor, hypernephroma.

During urologic consultation the patient gave no history of renal pain or hematuria.

The right kidney was markedly enlarged, hard and movable. It appeared twice as large as the left kidney on the anteroposterior x-ray views, with poor filling calyces. The diagnosis was right renal tumor.

Regardless of the fact that she had metastases and the outlook was hopeless, operation was advised to remove the right kidney in the hope that the tumor might be radiosensitive. The surgical pathologic condition was adenocarcinoma of the right kidney. The histopathology was clear carcinoma of kidney.

The specimen consisted of kidney measuring 14 by 8 by 7 cm. One pole was replaced by a yellowish hemorrhagic tumor which both compressed and invaded the kidney.

Microscopically, the section showed a degenerated fragment of kidney tissue bordering on tumor area. The tumor consisted of large cells characterized by necrosis and hemorrhage. As treatment the left shoulder was immobilized; two blood transfusions were given and x-ray therapy to ribs and clavicle was instituted. The patient was discharged from the hospital and referred for further x-ray therapy to the outpatient department on July 7, 1947. On August 16th the patient died at home.

SUMMARY

Two cases of spontaneous pathologic fractures of the clavicle have been presented, one due to adrenal gland malignancy and the other to adenocarcinoma of kidney.

It is noteworthy that in each case the onset was sudden and followed some slight use of the upper extremity although in each case a history was given of moderate pain in the shoulder region for several weeks preceding the acute severe pain but not severe enough for the patient to consult a physician. Here is indication that the metastases of the clavicle were present and the acute pain followed the final fracture.

Noteworthy is also the fact that in neither case was there any complaint relative to the organ that was the primary focus of malignancy.

Both patients expired within a period of about seven weeks from the time of discovery of the pathologic fracture of the clavicle. This would indicate that when metastasis has occurred in the clavicle, the disease is well advanced and the prognosis of early demise is warranted.

REFERENCE

1. Simpson-Smith, A. Spontaneous fracture of clavicle; gumma. *Tr. M. Soc. London*, 53: 73, 1930.

TRAUMATIC ANEURYSM OF THE INTERNAL MAMMARY ARTERY*

EDWARD O. FINESTONE, M.D.
New York, New York

THE literature is replete with reports of all types of aneurysms including pulsating hematoma, false aneurysm and arteriovenous fistula. These involve the aorta and peripheral vessels. In spite of the great number of war injuries reported, especially those that concern the chest, there is no report of any aneurysms involving the internal mammary artery. A careful search of the literature for the past twenty years fails to disclose any case similar to the one described in this article.

The nearest approach to it in similarity is the case of a traumatic spurious aneurysm involving the intercostal artery. This case was reported by Guardascione[3] who described a severe contusion of the thorax in a man who was found to suffer fractures of the right second and third ribs near their costovertebral angles. He developed traumatic pleurisy and subcutaneous emphysema for a short time following his injury. He resumed work after six weeks and died suddenly five months following his injury. At the time of death he had a profound hemoptysis. Autopsy revealed an aneurysmal sac which had penetrated into the right lung and had perforated into the bronchotracheal tree. The aneurysm was derived from the intercostal artery at the site of the healed fracture of the second rib.

Although several large series of war injuries involving the chest have been reported,[1,2,4,5] only casual mention is made of any involvement of the internal mammary artery. This structure has been the site of injury in 4 per cent of all penetrating chest wounds during the war.[4]

The following case report derives interest from the fact that the diagnosis of traumatic aneurysm was made preoperatively. It also shows the various types of treatment indicated in three phases of the case, namely, (1) immediate treatment at the time of injury, (2) definitive treatment for the aneurysm and (3) subsequent decortication and treatment of the empyema.

The patient was a twenty-eight year old colored male who entered the Sydenham Hospital on October 1, 1948, in a state of shock with multiple lacerations involving his face, arms, right kidney region and chest. All the lacerations were superficial, with the exception of the last. This laceration measured 1½ inches in length and extended obliquely over the internal end of the right fifth costal cartilage. There was not much bleeding from the wound. There was no sucking or subcutaneous emphysema. Examination of the chest revealed considerable dullness and flatness indicative of a hemothorax. This was confirmed by x-rays of the chest which revealed a hemopneumothorax occupying about half of the right chest cavity with a shift of the mediastinum to the left.

The patient was in obvious shock, with a systolic blood pressure of 80. Diastolic pressure was not obtained. He presented minimal respiratory distress. After administration of 500 cc. of plasma followed with 2,000 cc. of 5 per cent glucose in saline intravenously, his general condition improved; his blood pressure rose to 90/60. There was some slight rigidity in the right upper quadrant of the abdomen. The impression was that the patient had suffered a penetrating stab wound of the right chest with hemopneumothorax incident to involvement of the intercostal vessels, the internal mammary vessels or the lung. The signs in the right upper quadrant of the abdomen were deemed to be due to minimal trauma to the diaphragm or liver. The attending surgeon believed that conservative treatment was indicated since the respiratory and cardiovascular functions were not seriously disturbed and since the patient's general condition improved and became well stabilized following supportive treatment on admission.

Four days after admission check-up x-rays

* From the Surgical Service of the Sydenham Hospital, New York, N. Y.

revealed a disappearance of the pneumothorax, but the fluid still occupied the lower half of the right chest. The lung was clear. The patient was feeling well. He suffered no pain, respiratory distress or fever. During the course of the first week aspiration of the right chest yielded only 100 cc. of blood, most of which had clotted.

One week following admission the patient arose from bed without permission and went to the lavatory. While straining at stool he suddenly went into shock, with respiratory distress, rapid pulse and low blood pressure. Examination of the chest now revealed an increase in the pleural effusion. This was confirmed by x-ray. There was a to and fro machinery murmur localized directly over the wound which had now healed.

The patient was again given supportive therapy by means of intravenous fluids and a transfusion so that he recovered from shock after a period of a few hours. He now appeared pale with more rapid pulse and respiration, elevated temperature and the signs of increased fluid in the right chest. The impression was that he had suffered a secondary hemorrhage from a ruptured aneurysm of the internal mammary vessels, with increased pleural effusion. Because of this red signal it was deemed imperative to subject him to exploration rather than to continue to support him with transfusions and perform repeated tappings of the pleural cavity.

Accordingly, on October 8, 1948, an operation was performed for the ligation of an aneurysm of the right internal mammary artery. Since the general condition of the patient was precarious and because further bleeding was anticipated, general anesthesia was not used. Under local anesthesia a vertical incision was made over the right rectus in the paramedian line. The rectus muscle was retracted and the deep epigastric vessels ligated as high up as possible. The wound was then closed, except for the upper portion of the skin incision. Another incision was made vertically in the right parasternal line, beginning over the third costal cartilage, continuing it down almost to the wound. The third and fourth costal cartilages were removed and the internal mammary vessels ligated as low as possible. By this procedure (of ligating the deep epigastric vessels in the abdomen and the internal mammary vessels above the laceration of the chest) the danger of hemorrhage from the aneurysm was reduced to a minimum. Thereupon, an incision was made over the original laceration, connecting both upper and lower preliminary incisions. Here, a clot representing the spurious aneurysm was found. It was traced down to and underneath the right fifth costal cartilage which was resected over a distance of about 3 inches. Up to this point the operation had been conducted under local anesthesia, without entering the right pleural cavity. Now because the clot was traced through the pleura the latter was entered and a huge gush of blood was expelled. Between 1,500 and 2,000 cc. of old fluid blood were removed. When the wound was entirely dry, bleeding could now be seen coming from the internal mammary vessels beneath the margin of the sternum. The bleeding was not very active and this was ascribed to the preliminary ligations. The vessel above and below the bleeding site was secured by sutures taken through the intercostal structures above and below the fifth costal cartilage where it joined the sternum.

The latter part of the operation was conducted under a small amount of general anesthesia. There was no unusual respiratory distress, the mediastinum being stabilized by traction on the lung. After complete evacuation of blood clots from the chest the lung was sutured into the margins of the wound which was completely closed. A stab wound was made in the right axillary line at the level of the eighth intercostal space and a Pezzer catheter introduced for underwater drainage.

The patient made an uneventful recovery without respiratory distress. After daily instillation of penicillin through the Pezzer catheter, it was removed on the sixth postoperative day. X-rays made a week following the operation showed a small amount of fluid with the lung clearing. The wound healed by primary intention and the sutures were removed one week postoperatively. At this time only 30 cc. of blood could be obtained by aspiration of the chest. In spite of antibiotics the fever persisted and after two weeks was septic in type. Three weeks postoperatively only 20 cc. of blood could be obtained by aspiration and it was deemed advisable to explore the chest. This was not carried out because the surgeon could not find any localized accumulation in the operating room and he did not think it wise to perform thoracotomy without a thorough localization of an accumulation of pus or blood.

One month following operation the patient was still running a septic course. X-rays showed fluid completely enveloping the right upper and lower lobes with a large loculated effusion extending from the fourth rib to the diaphragm posteriorly. A week later a complete decortication of the right lung was performed followed with underwater drainage. Cultures had been uniformly sterile except for one made at operation which showed Staphylococcus aureus. The patient did well following the decortication but a small residual empyema cavity developed which was drained on December 3, 1948, eight weeks following the original thoracotomy. Following this last operation the wound healed promptly and his respiratory function was completely restored.

SUMMARY AND CONCLUSIONS

1. A case of traumatic aneurysm of the internal mammary artery is presented.

2. Although injury to the internal mammary vessels follows in 4 per cent of penetrating wounds of the chest, no similar case has been recorded.

3. The case reported herein is of interest because a diagnosis was made preoperatively at the time of the secondary hemorrhage from the aneurysm.

4. The various types of treatment indicated in the three phases of the case are described.

REFERENCES

1. Burbank, C. B., Falor, W. H. and Jones, H. W. Three hundred seventy-four acute war wounds of thorax. *Surgery*, 21: 730–738, 1947.
2. Burke, J. and Jacobs, T. T. Penetrating wounds of chest. *Ann. Surg.*, 123: 363–376, 1946.
3. Guardascione, V. Post-traumatic aneurism of intercostal artery, rare case. *Rossegna Previd. Sociale*, 27: 28–35, 1940.
4. Johnson, J. Battle wounds of thoracic cavity. *Ann. Surg.*, 123: 321–342, 1946.
5. Day, E. B. and Meade, R. H., Jr. War injuries of chest. *Surg., Gynec. & Obst.*, 82: 13–24, 1946.

METASTASIS OF CARCINOMA OF STOMACH TO SUBMUCOSA OF RECTUM*

J. E. Scheid, M.D. and George Crile, Jr., M.D.
Cleveland, Ohio

DURING the past year we have observed three cases in which carcinoma of the stomach metastasized to the rectum. These metastases were not in the usual form of the rectal shelf or rectovesical pouch implant but were true lymphatic or hematogenous metastases to the wall of the retum. In two of the cases the patients were referred with a diagnosis of primary rectal carcinoma and digital examination revealed a stenosing, submucosal infiltration which began at the anorectal ring and extended upward to involve the whole rectum. Proctoscopic examination revealed no ulceration, and superficial biopsies of the rectal mucosa showed nothing but edema. Deeper biopsies obtained under anesthesia with the Silverman needle showed rectal wall infiltration by carcinoma simplex. In all cases carcinomas of the stomach were demonstrated. Because these lesions may simulate primary carcinoma of the rectum and because the true primary tumor in the stomach may give few if any symptoms, it is important to recognize the possibility that atypical infiltrating lesions of the rectum may be metastatic.

CASE REPORTS

Case 1. A sixty year old white woman had noted intermittent lower abdominal cramps for six months prior to admission. Five weeks before admission diarrhea alternating with constipation began and the cramping lower abdominal pain increased. The patient had lost 15 pounds. There were no complaints referable to the upper gastrointestinal tract and no history of rectal bleeding was elicited.

On physical examination the positive findings were limited to the abdomen and the rectum. A smooth rounded mass was palpable in the upper abdomen which was thought to be liver. Rectal examination revealed a firm, fixed, stenotic mass which began at the level of the anorectal ring and involved the palpable portion of the rectum.

Carcinoma of the rectum was suspected but superficial biopsies showed nothing but edema of the mucous membrane. A deeper biopsy was taken with a Silverman needle and this revealed carcinoma simplex infiltrating the mucosa. X-ray of the stomach showed extensive infiltration by scirrhous carcinoma.

Case 11. A fifty-seven year old white woman was admitted to the Cleveland Clinic Hospital with a history of epigastric fullness and bloating of two years' duration and of increasing constipation for one year. For the month prior to admission she had had diarrhea but the stools never contained blood.

Physical examination revealed an emaciated woman who appeared acutely and chronically ill. A hard, fixed, epigastric mass which measured approximately 10 cm. in diameter was found. There were multiple hard, deep nodules in both lower quadrants and moderate ascites was present. The rectovaginal septum and adnexae were completely infiltrated and fixed, and the rectum contained a bulky stenosing mass. Biopsy of the mucosa was not diagnostic but the sections obtained by the Silverman needle showed carcinoma simplex in the submucosa and muscularis of the rectum. (Fig. 1.) No treatment was advised. The patient expired after an operation at another hospital at which time scirrhous carcinoma of the stomach, subserosal pelvic and rectal infiltration, and Krukenberg tumors of the ovary were demonstrated.

Case 111. A fifty-four year old white woman entered the Cleveland Clinic Hospital on April 2, 1949, complaining of dysphagia for one year, severe pain in the epigastrium for six weeks and a weight loss of 30 pounds. Physical examination was essentially negative but gastrointestinal x-rays revealed a neoplasm of the cardia. A thoracicoabdominal total gastrectomy was performed on April 4, 1949.

On pathologic examination the ulcerating tumor was situated in the cardia on the lesser

* From the Cleveland Clinic and The Frank E. Bunts Educational Institute, Cleveland, Ohio.

curvature and measured 6 cm. in diameter. The histologic picture was one of undifferentiated carcinoma with marked intralymphatic infiltration of the submucosa

In June, 1950, she noted constipation and a sense of rectal discomfort. In July examination revealed a large, bulky, stenosing, submucosal tumor mass in the rectum which began at the anorectal ring and involved the whole rectal segment. This was considered to be rectal metastasis and colostomy was recommended.

FIG. 1. Case II. Carcinoma simplex invading submucosa and lamina propria of rectum. × 70.

COMMENTS

The rectal metastasis in these cases does not represent merely a rectal shelf with secondary infiltration of the wall of the rectum. The infiltration is diffuse, annular and is not necessarily accompanied with implantation of tumor on the peritoneal surfaces, as was proven in Case II. Although the metastatic route has not been established, it seems likely that it progresses by way of the lymphatics, perhaps by retrograde flow due to blockage of the lymphatics above.

Only a few cases with lesions of this type have been reported but in all there is a striking similarity to the lesions reported here. In Heller's case[1] the patient was thought to have primary carcinoma of the rectum and a combined abdominoperineal resection was performed. Postmortem examination showed colloid carcinoma of the stomach with histologic appearance similar to the rectal lesion. A significant finding was the presence of a mediastinal chylous retention cyst, which had blocked the thoracic duct and was presumed to have induced a retrograde lymphatic flow. Not only was the rectum involved but also there were multiple, annular, submucous, intralymphatic metastases throughout the small intestine.

Dixon and Stevens[2] reported five patients, and Karstens and Bargen[3] two patients with diffuse infiltrating metastases to the colon from linitis plastica of the stomach. The nature of the disease was proven at autopsy in four of these cases. One of these patients had involvement of the rectum, and in the others the lesions were confined to the colon above the sigmoid. David[4] discussed intestinal spread of carcinoma of the stomach and reported a case similar to ours.

The chief importance of this lesion is its resemblance to primary carcinoma of the rectum and the danger that it may be treated as such. In Case I and II as well as in the reports of others[2,3] the primary symptoms were intestina and consisted of varying degrees of large bowel obstruction. The first patient had no complaints referable to the upper gastrointestinal tract. Two of the cardinal features of primary carcinoma of the rectum, namely, rectal bleeding and mucosal ulceration, were absent in all of our cases and this finding should lead one to suspect that the lesion is metastatic.

On rectal examination there is stenosis and infiltration of the rectal wall. On proctoscopic examination, the mucosa is edematous but there is no ulceration or bleeding. Rectal biopsy by the usual method does not as a rule go deeper than the mucosa and hence fails to show the carcinoma which is infiltrating the deeper structures. It is therefore necessary either to take a deep biopsy with the patient under anesthesia or to obtain a biopsy with the Silverman needle. This instrument can be inserted deeply through the rectal wall or pararectally through the perineum and obtains a core of tissue from the deeper portions of the rectal wall. Routine rectal biopsy failed to reveal the lesion in all instances since the speci-

mens were superficial to the pathologic condition. The Silverman needle method of biopsy, we believe, is the best method of obtaining deeper tissue sections. This procedure is well established as a method of biopsy of the liver and thyroid, and its application here further illustrates the importance of its inclusion in every surgeon's armamentarium.

SUMMARY

1. Three instances of metastasis of carcinoma of the stomach to the rectum are reported.

2. The lesions reported here are not the common rectal shelf but are submucosal metastases to the wall of the rectum.

3. Since carcinoma of the stomach may give no upper abdominal symptoms and since the rectal symptoms and signs may simulate primary carcinoma of the rectum, it is important to establish the true nature of all rectal lesions before recommending radical operations.

REFERENCES

1. Heller, E. L. Carcinoma of stomach with multiple annular metastatic intestinal infiltrations. *Arch. Path.*, 40: 392, 1945.
2. Dixon, C. F. and Stevens, G. A. Carcinoma of linitis plastica type involving intestine. *Ann. Surg.*, 103: 263, 1936.
3. Karstens, H. C. and Bargen, J. A. Carcinoma of colon simulating linitis plastica; report of two cases. *Proc. Staff Meet., Mayo Clin.*, 22: 231, 1947.
4. David, V. C. Malignancy in linitis plastica. *S. Clin. North America*, 11: 47, 1931.
5. Ewing, J. Neoplastic Diseases, 4th ed. Philadelphia, 1940. W. B. Saunders Co.

According to Baronofsky et al., who performed gastrectomies on cats, more efficient emptying of the gallbladder occurs in their experiments when the Billroth II type of operation has been performed with a short duodenojejunal loop. The animals in which gastrointestinal continuity was restored by a long loop showed a less effective emptying of the gallbladders. This is important because the neutralizing effects of biliary and pancreatic secretions in patients with hyperacidity are very valuable in preventing the formation of ulceration after gastrectomy. Another valuable factor, of course, is the removal of a sufficiently large acid-bearing area of the stomach. (*Richard A. Leonardo, M.D.*)

CALCIFICATION IN SCIRRHOUS CARCINOMA OF THE STOMACH*

JOHN W. ROBERTSON, M.D. AND SUYDAM OSTERHOUT, M.D.
Philadelphia, Pennsylvania *Cleveland, Ohio*

CALCIFICATION in scirrhous carcinoma of the stomach is rare. In a review of the literature only one proven case was found. Abel in 1939 observed calcification of the stomach by x-ray and found it to be present in scirrhous carcinoma at both celiotomy and autopsy. The present communication is the report of a proven case of calcification in scirrhous carcinoma of the stomach.

CASE REPORT

T. C., a seventy-five year old man of Hungarian descent, was admitted to Cleveland City Hospital in December, 1949, because of an easily palpable epigastric mass found on routine physical examination. He had been in an infirmary for many years because of partial blindness and deafness. There was no history of anorexia, nausea, vomiting, hematemesis, tarry stools or other symptoms referable to the gastrointestinal tract. The patient stated that he had lost approximatly 50 pounds in the past ten years but he attributed this to his inability to eat because he had no dentures. There was no history of recent acceleration of weight loss.

The patient had previously been admitted to this hospital in July, 1947, when a well differentiated epidermoid carcinoma was removed from the pinna of the left ear. There was no history of cancer or tuberculosis in his immediate family.

On physical examination the patient was a well developed, poorly nourished man with normal temperature, pulse and respiration and a blood pressure of 140 systolic and 70 diastolic. The eyes showed peripheral corneal opacities and the right iris presented a V-shaped defect. There was no evidence of recurrent tumor of the left ear. The abdomen was flat and easily palpable. An irregular, slightly tender, firm mass giving a vague outline of the stomach was palpated in the epigastrium to the right of the midline. This mass moved slightly with respiration but was fairly fixed. No other abdominal masses or organs were palpated. There was bilateral shotty cervical and supraclavicular lymph nodes. The remainder of the physical examination was essentially negative.

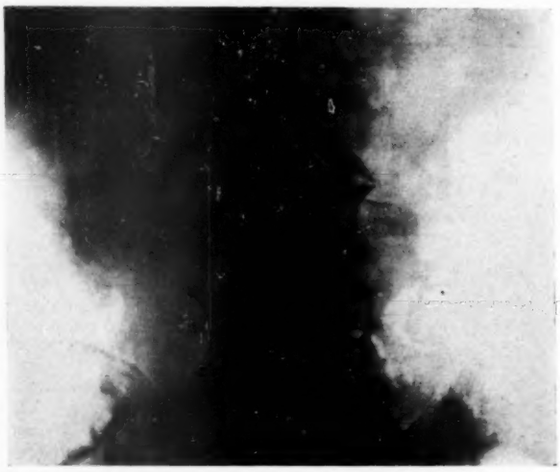

FIG. 1. Mottled poorly outlined shadow is shown to the right of and overlying the 2nd and 3rd lumbar vertebrae and represents calcification in the stomach wall.

The red blood cell count was 3.4 million with 12 gm. of hemoglobin and the white cell count was 9,000 with a normal differential. Urinalysis was normal. The blood urea nitrogen was 12.3 mg., fasting blood sugar 99 mg. and calcium 9 mg. per 100 cc. Total protein was 7 gm. per 100 cc. with 3.8 gm. of albumin and 3.2 gm. of globulin. The blood amylase was normal. The blood Kline test was negative. Gastric analysis revealed no free hydrochloric acid, either before or after histamine. X-ray examination of the chest was normal. A film of the abdomen showed a poorly outlined, mottled, calcific shadow in the epigastrium in the region of the described mass. (Fig. 1.) Gastrointestinal series showed moderate dilatation of the stomach and marked retention of barium. There was no filling defect.

* From the Departments of Surgery and Pathology of Cleveland City Hospital and Western Reserve University School of Medicine, Cleveland, Ohio.

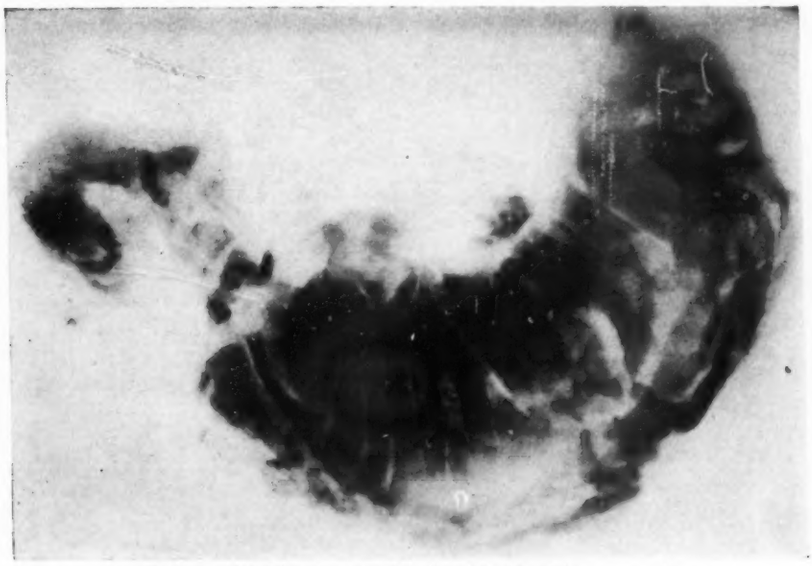

FIG. 2. Calcification in the distal half of the stomach.

Ten days after admission symptoms of complete intestinal obstruction developed. Celiotomy was performed and the anterior and posterior walls of the stomach were found to be infiltrated with neoplastic tissue; there were enlarged, firm regional lymph nodes. Because of the massive involvement of the stomach gastrojejunostomy could not be performed and a Stamm type jejunostomy with biospy of the stomach wall was done. The patient did well immediately after operation but died in sleep two days later.

At autopsy the distal two-thirds of the stomach were markedly thickened, firm and rigid. The serosal surface was smooth, grey and glistening. On opening the stomach the contour of the lumen was preserved although it became increasingly narrow toward the distal portion so that only a small opening was present at the pylorus. The mucosa was soft, pink and granular, no rugal folds being present in the distal two-thirds. Multiple transverse sections of the wall of the stomach revealed it to be markedly thickened throughout its distal two-thirds, measuring 3 to 4 cm. in its thickest portions. The cut surfaces were for the most part firm, pale yellow and homogeneous. Scattered throughout the thickened portions of the stomach were numerous irregular, poorly defined, white, granular foci of material which varied from 0.1 to 0.5 cm. in greatest dimension and which imparted a gritty sensation to the knife on section. None of these white foci was found in the serosa or mucosa of the uninvolved stomach. Several firm, enlarged oriental lymph nodes were present along the greater curvature of the stomach, and on section of these nodes the surfaces were firm, homogeneous and pale yellow. Histologic examination of the stomach revealed a moderately well differentiated mucinous adenocarcinoma in which there were scattered foci of calcification and necrosis. Metastatic adenocarcinoma was present in the enlarged lymph nodes but no calcification was present.

A high concentration of calcium was present on chemical analysis of the gritty, granular foci within the tumor. Roentgenogram of the excised stomach again demonstrated the mottled calcific shadow reported in the abdominal x-ray of the patient. (Fig. 2.)

COMMENTS

Pathologic calcification in human tissues is usually seen as a result of one of two mechanisms: (1) abnormally high concentration of calcium or phosphate in the blood with precipitation of calcium phosphate in healthy tissue or (2) local tissue damage with precipitation of calcium phosphate in the presence of normal blood levels. That alkaline changes in the pH or an increase in the concentration of phosphatase of the tissue may effect the predilection for abnormal calcification is seen by the common occurrence of calcification in the lungs, gastric mucosa and renal tubules. Calcification

of healthy tissue as a result of an elevation of calcium or phosphate in the blood occurs in hyperparathyroidism and vitamin D intoxication while calcification as a result of local tissue damage is observed in tissues showing necrosis, fibrosis, hyaline change and neoplastic growth.

The presence of numerous foci of necrosis within the tumor in this case is probably sufficient to explain the local deposition of calcium. That this event occurred in the stomach is of interest since changes in local tissue pH influence the deposition of calcium. However, this latter factor was probably not of much significance in this case since gastric analysis revealed impaired secretion of free acid.

SUMMARY

A case of mucinous adenocarcinoma of the stomach wall with marked calcium deposition is described. An unusual degree of necrosis was also found throughout the tumor and it is suggested that this case is an instance of calcification in necrotic tissue. Clinically, the case was of interest because of the unusual roentgenolgic appearance of the gastric cancer.

REFERENCES

1. Abel, W. Zur Diagnose der Magenwandverkalkungen. Fortschr. a. d. Geb. d. Röntgenstrahlen, 59: 57, 1939.
2. Boyd, W. A Text-Book of Pathology, 5th ed., p. 45. Philadelphia, 1947. Febiger.
3. Karsner, H. T. Human Pathology, 7th ed., p. 81. Philadelphia, 1949.
4. Meeker, D. R. and Kesten, H. D. Composition of pathological calcium deposits. *J. Biol. Chem.*, 113: 289, 1936.
5. Mulligan, R. M. Metastatic calcification. *Arch. Path.*, 43: 177, 1947.
6. Vaughan, J. H., Sosman, M. C. and Kinney, T. D. Nephrocalcinosis. *Am. J. Roentgenol.*, 58: 33, 1947.

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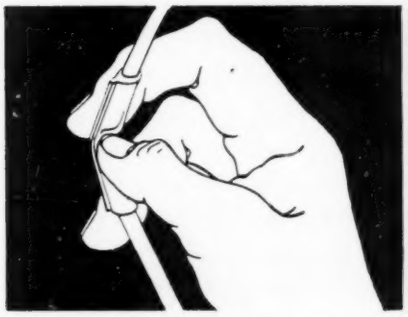

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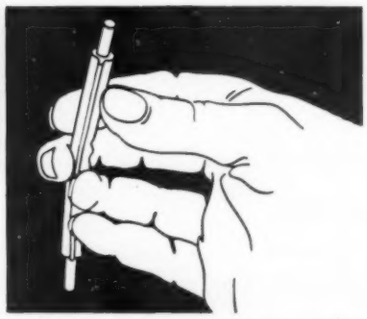

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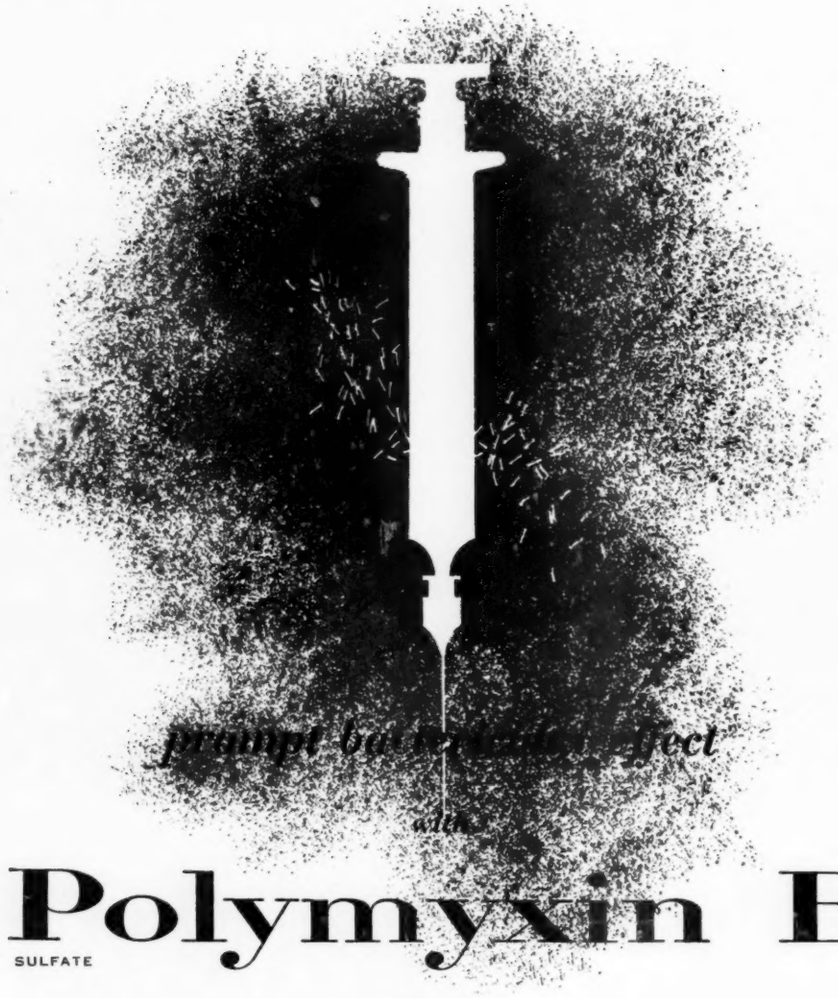

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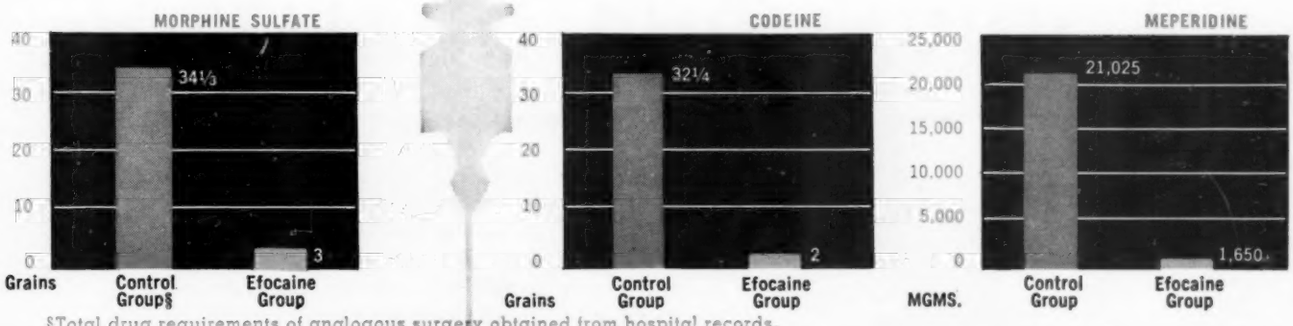

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‡Iason, A. H., and Shaftel, H. E.: A New Approach to the Problem of Postoperative Pain, Am. J. Surg. 83, (April) 1952.

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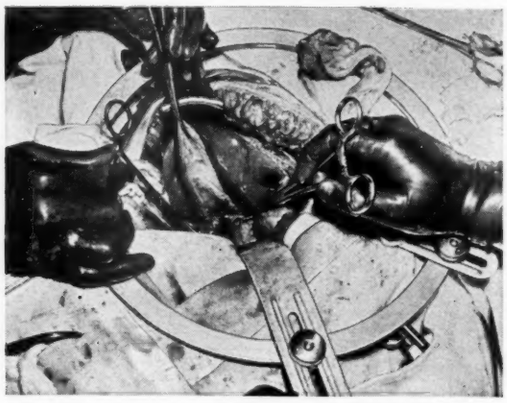

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Edited by Marion E. Howard, M.D., F.A.C.P., Associate Clinical Professor, Department of Internal Medicine, Yale University School of Medicine, this edition has been completely rewritten and reset. Descriptions of 1,475 newly introduced drugs, biologicals and allergens have been added in order to keep abreast of important therapeutic advances. A preparation is described, its action and uses are outlined, the method of administration is told and the form of supply given. The trade name with the name of the manufacturer head each product. Obsolete preparations have been deleted, unreasonable claims have been omitted. Generous cooperation of the many contributing drug companies has provided the material necessary to bring this edition up-to-date. It is a large book—1,431 pages. Every edition has had a deservedly large sale and this present 5th edition, we hear, is a truly best seller. Any physician who purchases a copy of the Modern Drug Encyclopedia and Therapeutic Index will quickly agree he made a necessary and wise buy. It is published by Drug Publications, Inc., New York. $15.00.

IN our early days we discovered Williams' "Obstetrics." It was one of the pleasant surprises in the building of a medical library. We thought Williams was head and shoulders over all other scientific writers; we still think his book a classic. After Williams died (he did six editions), Stander, who was trained by Williams, occupied the Chair at Cornell. He brought out the seventh edition and practically rewrote it. In Stander's time many new advances had been made which were unknown to Williams. Stander's work was exceptionally fine, beautifully written, and admitted by almost everyone to be in Williams' class. He did three editions. After Stander's death, Nicholson J. Eastman, Professor of Obstetrics at Johns Hopkins University, brought out the tenth edition. In his preface he says, in part, "The purpose of this volume is to set forth in a comprehensive manner the principles and the practice of modern obstetrics for both medical student and practitioners . . . the many important advances in the science and art of obstetrics over the past decade have dictated the inclusion of a large amount of new material and as a consequence, approximately 55 per cent of the present text and over one-third of the illustrations are new."

There is no need to dwell on the contents. Suffice it to say this volume has everything a student or the mature-minded obstetrician could wish for. Eastman, an able craftsman, has written an outstanding work. One senses the author is an eminent authority, which in truth he is. In our judgment this edition is by far the best to date. It, too, is beautifully written. The illustrations are far above average; a bibliography is found at each chapter ending; the book is 1,176 pages long, has 659 figures and an index. Williams' "Obstetrics" has been popular throughout the years and has enjoyed a wide distribution in medical schools and among practicing physicians. This edition, written by Eastman, is sure to continue that popularity and deserves to be in the library of everyone who "does obstetrics." It is published by Appleton-Century-Crofts, Inc., New York.

THE Research Foundation of the State University of New York has received a grant of $2,500 from Ciba Pharmaceutical Products, Inc., Summit, New Jersey, to continue the support of work begun in endocrinology by Dr. Charles W. Lloyd, Assistant Professor of Obstetrics, at the State University College of Medicine at Syracuse. Dr. Lloyd is doing research work in hormonal factors involved in water excretion, particularly with patients having abnormal water retention.

(*continued on page 44*)

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* Ref. Am. J. Surg., March, 1951.
J.A.M.A. April 21, 1951 p. 1238

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(*continued from page 42*)

In addition, the Research Foundation has received a grant of $3,600 from the Sterling Winthrop Research Institute, Rensselaer, New York, for use by Dr. Alfred E. Farah, Associate Professor of Pharmacology, as a Fellowship Fund and Research Grant in the general field of diuretics and in particular on studies dealing with the mechanism of diuresis.

WE copy the following from a recent issue of "TIME."

"Ever since a siege of rheumatic fever at eleven, Mary Dansereau had been facing the prospect of an early death. The mitral valve of her heart had become calcified. To maintain circulation, her damaged heart had to work harder, and it was slowly giving out. For four years she had been a semi-invalid, unable to do much for her two children, and so weak that she took an hour to make a bed.

"Last December, over the objections of nervous relatives, Mary agreed to undergo a delicate operation. Doctors explained that the radical repair job they had in mind had been tried before, although none of the patients had lived long enough to prove the method successful. But at 37, Mary was convinced that life would be worthwhile only if she could be cured.

"At Boston's Peter Bent Brigham Hospital, surgeons cut into her heart and enlarged the opening of its mitral valve. They anchored a small (½-in.) lucite ball on a steel suture just below the flaps of the valve. The plastic ball can move just enough to allow blood to drain downward into the ventricle. It moves up to act as a stopper in the mitral valve when the heart contracts to pump blood into the aorta.

"Now, two months later, Mary Dansereau is the only human with a part-plastic heart. She will have to take life easy for a while, but even before she left the hospital she felt so much better that she was able to kick up a little jig of joy."

MR. B. J. TODD, Director, Ortho Research Foundation, Raritan, New Jersey, recently announced the appointment of Dr. Carl G. Hartman to Associate Director of Research. Dr. Nathan Millman has been appointed Associate Director of the Division of Physiology and Pharmacology. Dr. Hartman has been identified with the Universities of Iowa, Texas, Chicago, Columbia and California. He spent many successful years with the Carnegie Embryological Laboratory at the Johns Hopkins Medical School. From 1941 to 1947 Dr. Hartman was Professor of Zoology and Head of the Department of Zoology and Physiology at the University of Illinois. From here he came to the Ortho Research Foundation as Director of Physiology and Pharmacology. In 1946 Dr. Hartman received the Squibb Award from the Endocrine Society for his consistently basic contributions over the years to the endocrinology of reproduction.

VETERANS Administration announced for the first time the number of military personnel who have returned to civilian life as veterans since the Korean conflict started June 27, 1950. As of January 31, 1952, there were 655,000 living veterans with U. S. military service since the Korean conflict began. This is an average discharge rate of nearly 35,000 a month for the nineteen-month period. Many of these since-Korea veterans also saw service during World War II.

A total of 135 veterans who were disabled in service since June 27, 1950, were being rehabilitated on January 31, 1952, under the Vocational Rehabilitation Act to overcome the handicaps of their disabilities. Of the 135 veterans, ninety-nine were in school training; four in institutional on-farm training and thirty-two in job training. Institutional on-farm training combines class room studies with practical work on the farm. As of December 31, 1951, a total of 3,988 were drawing compensation for service-connected disabilities or pension for non-service-connected disabilities.

VA hospitalization was being provided on January 31, 1952, for 1,862 veterans with service since Korea. In addition to living veterans with service since Korea, VA was furnishing benefits to dependents of deceased veterans of the Korean conflict. As of December 31, 1951, 17,061 dependents of 8,895 such deceased veterans were receiving VA death compensation or pension. On the same date, VA had allowed 4,521 claims for indemnity payments to survivors under Public Law 23, the Servicemen's Indemnity and Insurance

(*continued on page 46*)

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(*continued from page 44*)

Acts of 1951. This is the law that provides a free indemnity of up to $10,000 less any GI insurance in force, for the immediate family of eligible servicemen and women who die in service or within 120 days of their discharge from service.

A PRIZE of $1,000 donated by the Kappa Delta Sorority may be awarded annually by the American Academy of Orthopaedic Surgeons for the best research related to orthopedic surgery and performed by an American citizen in the United States. This research must be presented to the Committee on Scientific Investigation of the American Academy of Orthopaedic Surgeons before November 1, 1952. Researchers interested in competing for this prize are requested to secure further information from Dr. Claude N. Lambert, 104 South Michigan Avenue, Chicago 3, Illinois, Chairman of the Award Committee for 1952.

THE medical and nursing professions will appreciate the convenience of the new "Cut-Quick" package in which Johnson & Johnson, manufacturer of surgical dressings, is making available its long-popular and widely used Red Cross Adhesive Tape and its recently introduced Red Cross Plastic Tape. With its serrated edge, the cover of the new package does the cutting when a strip of tape is needed. While doctors and nurses are adept at tearing off a strip of adhesive tape without twisting it, tearing the tape against the cover's cutting edge is easier than tearing it with unaided fingers, and a lot quicker than using scissors.

THE first carefully appraised estimate of the number of American citizens dying annually, as a result of drinking alcoholic beverages, has just been released by the American Business Men's Research Foundation.

"The actual number of such deaths ranges from a minimum estimate based on positive evidence, of 9,433, to a possible maximum estimate of 57,850, which for several reasons, may be much nearer the mark than the minimum figure. Every available source of information is being examined.

"One of the most significant, intensive studies of the alcohol factor is that reported by the Westchester County, New York, coroner's office, which reported that 24% of non-industrial deaths involved alcohol. Other carefully investigated figures of suicides and homicides, of occupational accidents, and non-industrial deaths involving alcohol, strongly indicate that the total number of deaths in which alcohol played a part, may well have reached the maximum figure noted, 57,850, approximately 4% of the 1,456,000 total deaths reported in the year 1950."

RUPTURES of the Rotator Cuff, by H. F. Moseley, M.A., D.M., M.Ch., is far above the average in every respect. It is the result of many years of intensive scientific work on the author's part. It is scientifically sound. It is an example of scientific writing made instructive and interesting in excellent prose. The colored illustrations by Helen MacArthur are indeed excellent. In all there are 108 illustrations, the greater number in color. The text covers Anatomic Considerations, Function of the Rotator Cuff, Clinical Picture, Operative Procedures, Treatment and Results, Author's Experience and Case Records. Any surgeon, general or orthopedic specialist, should possess this work and then read it carefully. Published by Charles C Thomas. $6.50.

At long last we have Sir Reginald Watson-Jones' Fractures and Joint Injuries. The first edition was published in 1940, and since then many thousand of these volumes have been sold throughout the world. Many chapters have been rewritten and new material has been added, bringing this work up-to-date. The illustrations deserve special mention. They are far above average and the colored plates, of which there are many, are beautiful. We were fascinated with the painted portraits of Hugh Owen Thomas and Robert Jones, especially the former with a peaked cap on his head and a lighted cigar hanging from his lips. This book needs no detailed review. It has everything and has been termed the one book every surgeon who does work on bones and joints, and every orthopedist should have in his library. This first volume is brought out by The Williams and Wilkins Company. $22.00 per set.

The Ciba Foundation has published in symposium form (249 pages and index) Liver Disease. The Consultant Editor is Sheila Sherlock, M.D., F.R.C.P. and the Editor for the Ciba

(*continued on page 48*)

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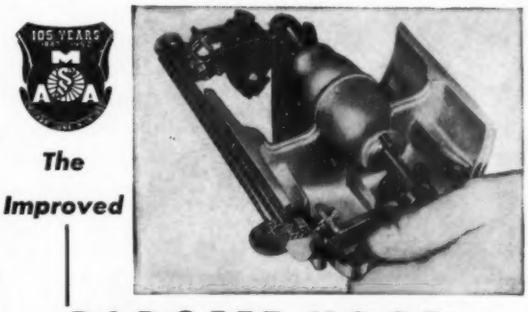

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(*continued from page 46*)

Foundation, G. E. W. Walstenholme, O.B.E., M.A., M.D. Part I: Protein Metabolism in Liver Disease; Part II: The Aetiology of Hepatic Cirrhosis; Part III: Aetiology of Portal Hypertension and Ascites and Its Treatment; Part IV: Pigment Metabolism; Part V: Splanchnic Blood Flow; Part VI: Infectious Aspects of Liver Disease. There are 112 illustrations. The Blakiston Company.

An outstanding issue among scientific journal publications is the October, 1951, number of the Bulletin of the Hospital for Joint Diseases. (The Bulletin is published twice a year.) This issue is the Henry L. Jaffe Anniversary Volume (a volume in tribute to H. L. Jaffe). Samuel Kleinberg is Editor-in-Chief. There are thirty-five articles by fifty-five contributors. The papers are of an exceptionally high order. The volume covers 527 pages and is illustrated. Published semi-annually by The Hospital for Joint Diseases, New York, N. Y. Single copies, $6.

The Thoracic Surgical Patient, Preoperative, Anesthetic and Postoperative Care by Lew A. Hochberg, M.D. Foreword is by Frank B. Berry, M.D.; contributors are Doctors H. Harvey Cooperman, Lewis Dickar, Barnett A. Greene, E. Harrison Griffin, Edward Hirsch, Lewis A. Hochberg and Emil A. Naclerio. The book covers Physiology and Pathologic Physiology, Endoscopy, Anesthesia, Injuries to the Chest, the Chest Wall, Empyema Thoracis, Collapse Therapy, Pulmonary Resection, Study of the Esophagus, Diseases of the Mediastinum, Diaphragmatic Hernia, Cardiovascular Surgery and Rehabilitation. There is a Bibliography and an index. Published by Grune & Stratton, Inc. $8.75.

We welcome Volume III of Post-Graduate Lectures on Orthopedic Diagnosis and Indications by Arthur Steindler, M.D., F.A.C.S. These volumes need no build-up; they are top quality in their field. This volume covers Tuberculosis of the Skeletal System and Osteomyelitis. It is highly recommended to general surgeons. The majority of orthopedic surgeons will own a copy. The book has 372 illustrations, 270 pages and an author and general index. $8.75.

Monographs on Surgery 1952, edited by B. Noland Carter, M.D., Ph.D., and as Advisory Editors, for gynecology, Joe V. Meigs, M.D., for urology, Charles Huggins, M.D., and for orthopedic surgery, Alfred R. Shands, M.D. This is the third volume of Monographs on Surgery, and they replace the previously published Nelson's Loose Leaf Surgery. There are twenty-three contributors. All subject matter is up-to-date and scientifically sound. It makes for good and instructive reading. The volume, 430 pages, is profusely illustrated and has references at chapter endings and a good index. The Williams & Wilkins Company. $12.50.

A Textbook of Clinical Neurology, with an Introduction to the History of Neurology, by Israel S. Wechsler, M.D., is a seventh edition. In the first edition, published in 1927, the author wrote, ". . . As this is essentially a textbook of clinical neurology I have attempted to present, wherever possible, the various diseases in such a way that the signs and symptoms grow out, as it were, of the anatomico-pathological substratum and are seen to be consequent upon the underlying physiological disturbance." One might say this is the theme running through the pages. We learn the text of this edition has been improved, and the new and valuable has been incorporated in the text, and all that appeared to be obsolete has been pruned away. In every way the work is up-to-the-minute. Naturally, a textbook that lives to a seventh edition needs no detailed review. It has earned its place among the readers. The book has 801 pages, copious references, 179 figures and an index. Published by W. B. Saunders Company. $9.50.

A BOOKLET which should be of considerable interest to any physician was published by the World Health Organization on March 10, 1952. Medical Certification of Cause of Death, prepared by the WHO Center for Classification of Diseases, aims to aid the physician to understand better the filling-out of the WHO International Form of Medical Certification of Cause of Death, the use of which has been adopted by many countries for the compilation of mortality statistics. Lack of sufficient comprehension of what the statistical office wants on the form, and consequent failure to note morbid conditions in their proper sequence or to supply accurate and adequate information can nullify efforts of health administrations to obtain valid statistics, which are the basis of many health programs as well as an invaluable tool in medical research.

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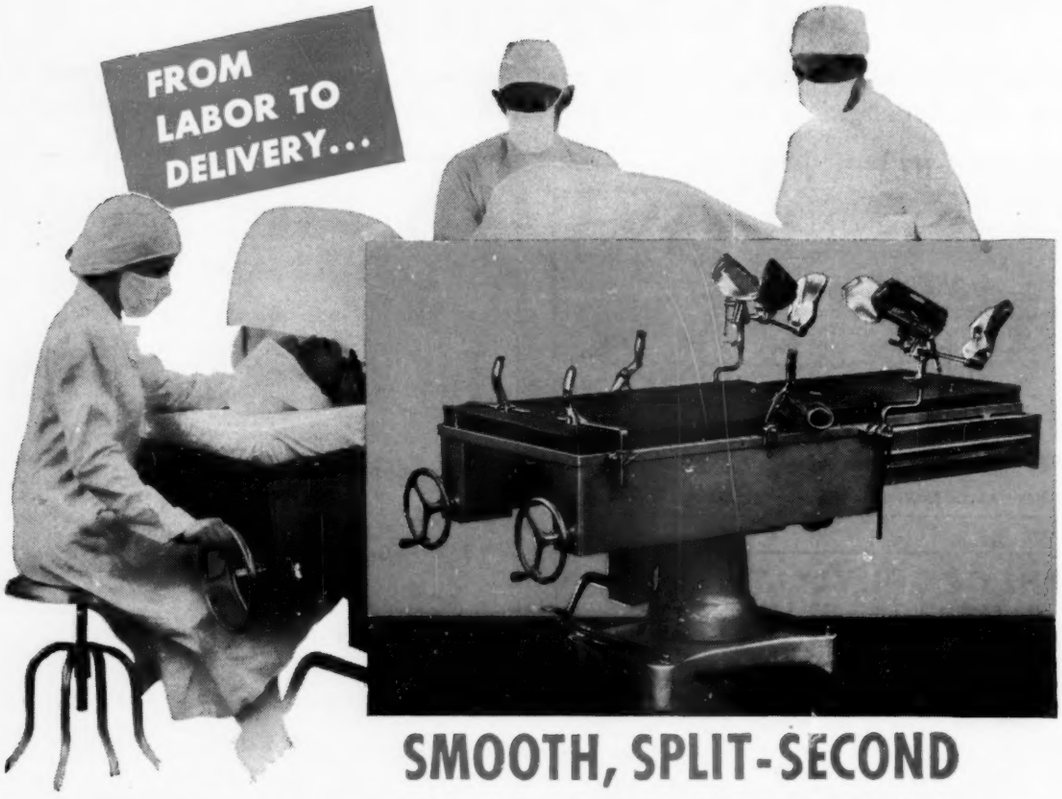

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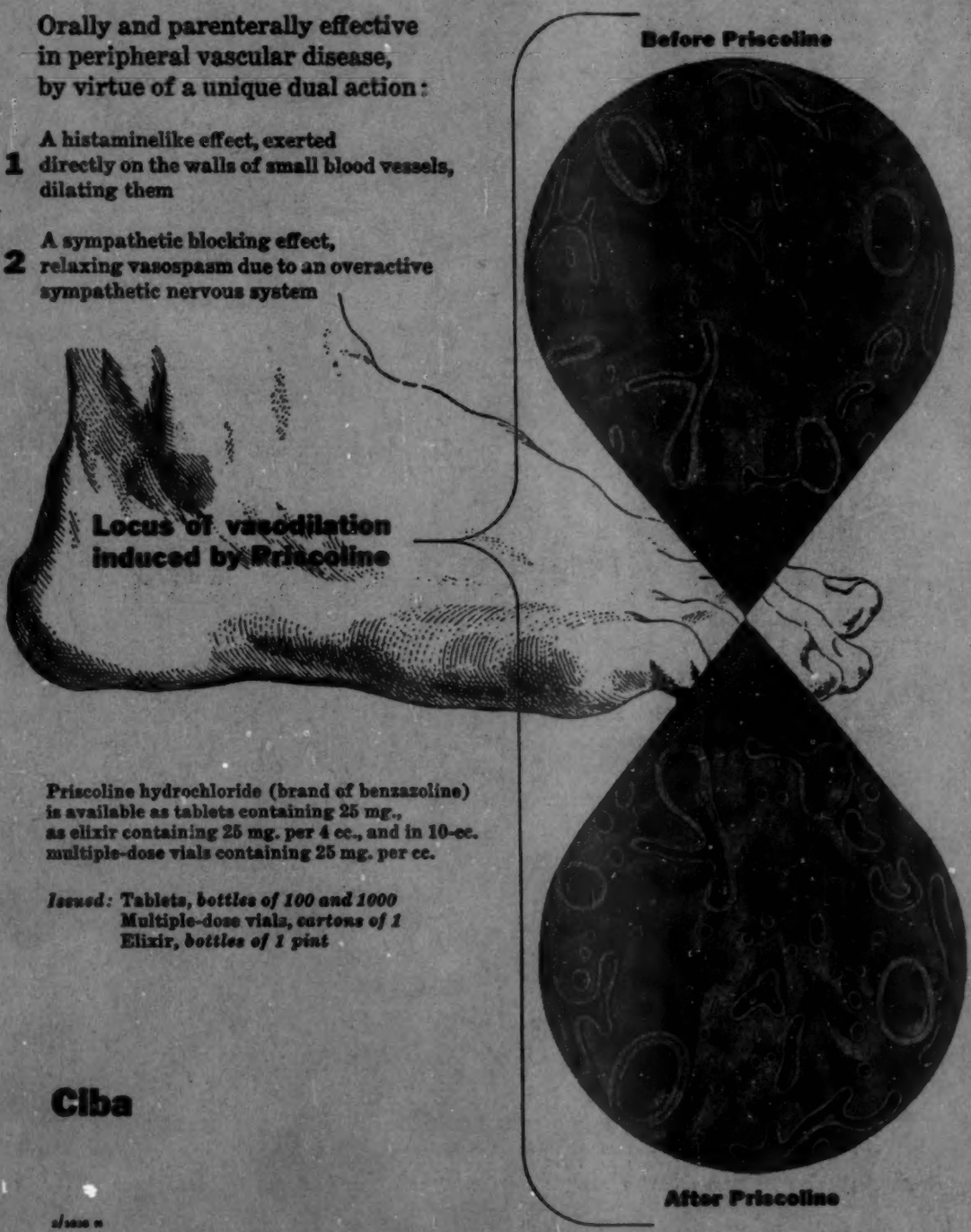

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